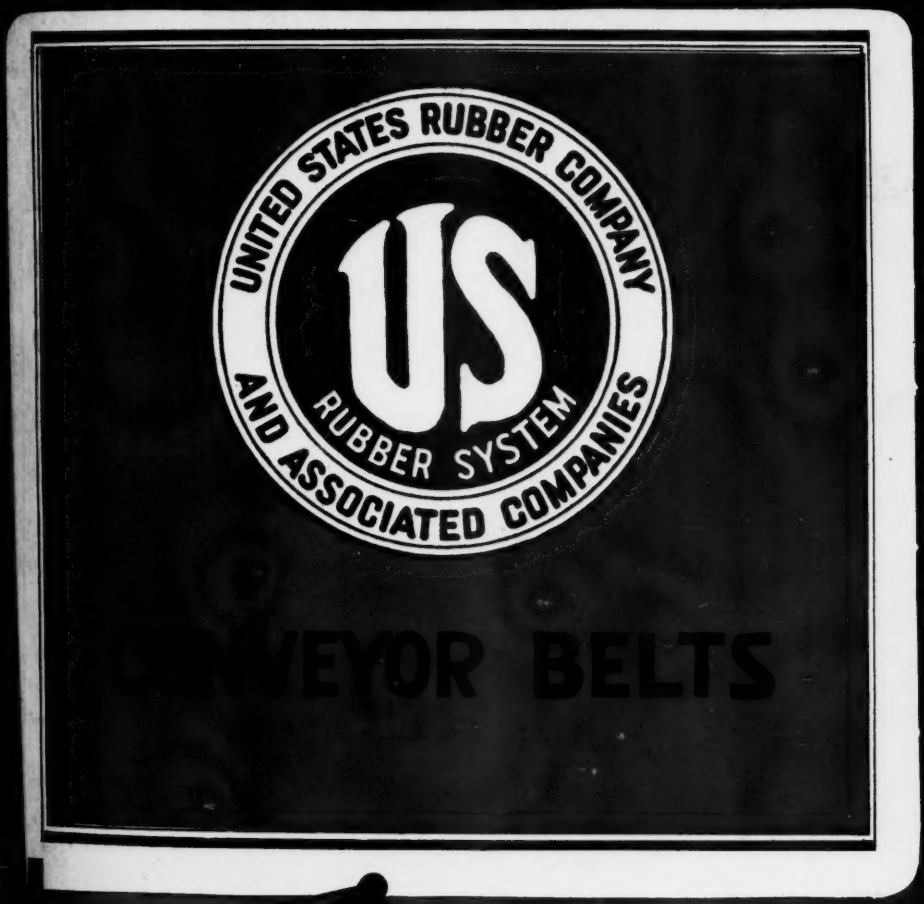
Pit and Quarry

GRAVEL ▪ STONE

HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING



APRIL, 1920

Index to Advertisers - - - Page 49
Power Plants Section - - Page 137

S-A SAFETY CAR PULLERS

Model 17-A
Self Contained
Motor Driven
Car Puller

Men make good engineers, but they don't operate to advantage as switch engines

FOR moving loaded or empty cars on your switch track use an S-A CAR PULLER. These machines "spot" the cars easily and quickly *where* you want them and *when* — no waiting — no fuss. Investigate these time-savers.

Specifications

Size of base	5 feet 3 inches by 3 feet 3 inches
Total height	3 feet 9½ inches
Size of capstan	8 inches by 10½ inches
Speed of capstan	48 R. P. M.
Pulling speed	100 feet per minute
Capacity	2,000 pounds, or 3 to 5 loaded cars
Motor required	7½ H. P.

CAR PULLER FOLDER SENT ON REQUEST

Stephens-Adamson Mfg. Co.
Aurora, Ill.

ERIE Shovel owned by White Oak Crushed Stone Co., New Britain, Conn.

In this quarry, the ERIE saves $70 a day

"The ERIE Shovel replaces 25 men in this quarry," *says B. J. Bixby Supt., WHITE OAK CRUSHED STONE CO., New Britain, Conn.*, "It saves more than $70 a day, after deducting all shovel expenses, including depreciation and interest.

"We have a hard trap rock in this quarry, and we need the compact and durable build of the ERIE."

The ERIE is the *RELIABLE* steam shovel. It is built with enough strength to work steadily, even when loading hard rock.

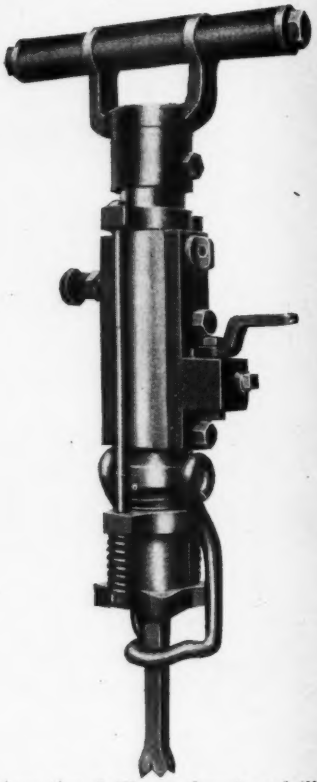
We would like to send you a Bulletin showing just what the ERIE Shovel can do. Write for a copy of Bulletin Q. Address:

Serves either as a Steam-Shovel or as a Locomotive Crane (with Clamshell Bucket)

BALL ENGINE CO., Erie, Pa.
Builders of ERIE Steam Shovels and Locomotive Cranes.

ERIE Revolving Shovels BALL Engine Co. Erie, Pa.

If You Can Reduce Your Drill Upkeep Costs From 14c to 5c per 8-Hour Run—



You want to accomplish this very desirable saving, of course. That's the record on an 8 months' test of

Hardsocg Wonder Drills

Observe These Advantages:

This drill can be operated either by compressed air or steam.

The use of live air or steam for operating the drill or cleaning drill hole of cuttings is controlled by one lever handle valve.

When in operation the piston hammer will not strike front end—thus eliminating breakages.

The lowest consumer of air of any drill made doing same amount of work. Fifty feet at 80 pounds pressure operates this drill successfully. Can you operate any other drill as economically?

Fewest number of parts, and lowest cost of upkeep.

Skilled labor not necessary with this drill.

Write for Descriptive Bulletin

Hardsocg Wonder Drill Company

Ottumwa, Iowa

LITTLE GIANT ROAD CRANE

COST OF PRODUCTION

Keep it down and you increase your business and increase your profit. That is the reason the **LITTLE GIANT ROAD CRANE** is a desirable piece of equipment for you to add. A mobile crane, capable of working any and everywhere, it gives you maximum handling efficiency with remarkably low maintenance cost.

Sounds interesting, doesn't it? Write for details. Address Dept. C.

The Locomotive Crane Company
OF AMERICA
CHAMPAIGN · ILLINOIS

PLYMOUTH

GASOLINE LOCOMOTIVES

No Matter What the Problem

No matter what the enterprise or industry, if haulage is a problem, then the Plymouth is the solution.

The Plymouth Gasoline Locomotive is the pioneer in industrial haulage. It has been the color-bearer for a score of years. It is the pacemaker with more speed, more power and more years of service.

Have you a haulage problem? Do you want to do more work for less cost and more profit? Do you want a way out of the lack of men and teams?

Then adopt the Plymouth way—Let the Plymouth take the grief and burden—Investigate now.

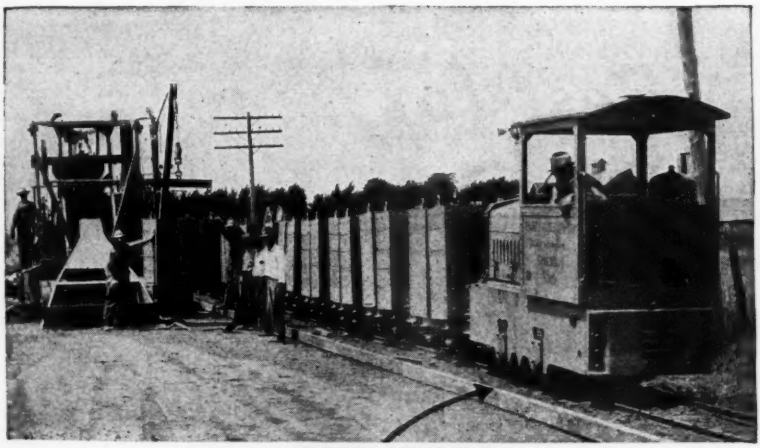
Our Engineers are at your service. Our Bulletins are full of industrial information and haulage solutions. Write for them.

The Fate-Root-Heath Co.

206 Riggs Avenue **Plymouth, Ohio**

WHITCOMB LOCOMOTIVES

ALL SIZES
FOR ALL CONDITIONS
POSITIVE GEAR AND FRICTION DRIVE
GASOLINE AND STORAGE BATTERY



SIX TON

3-Speed Positive Drive

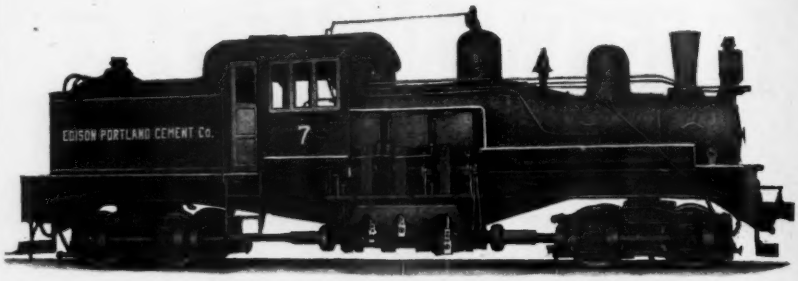
Road Contractors Special

This Six-Ton Gasoline Locomotive Will High Ball More Material to the Mixer Than Any Other Gasoline Locomotive Built of Its Weight.

Gasoline Locomotives, 2½ to 25 Tons. Storage Battery Locomotives, 2 to 8 Tons on Drivewheels.

GEO. D. WHITCOMB CO.

ROCHELLE ILLINOIS



60 Ton Shay—Edison Portland Cement Co.

Best for Your Service

Lima Locomotive Works build the best geared locomotive in the world—the "SHAY."

The "SHAY" is the only geared locomotive that has three cylinders.

This three-cylinder drive means continuous travel without backing up for slack or to get a run for grades.

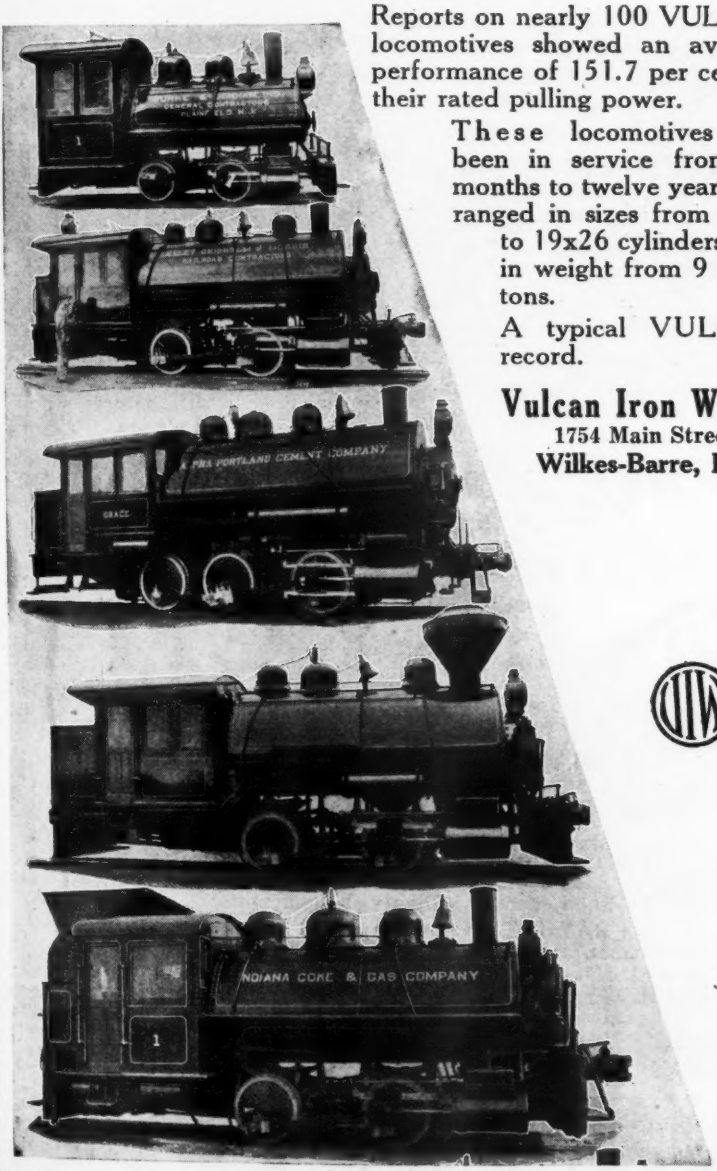
The best recommendation the "SHAY" has comes from satisfied users.

Lima Locomotive Works, Incorporated

30 Church St., New York

LIMA, OHIO

151.7 Per Cent Average Performance



Reports on nearly 100 VULCAN locomotives showed an average performance of 151.7 per cent of their rated pulling power.

These locomotives had been in service from six months to twelve years and ranged in sizes from 6x10 to 19x26 cylinders, and in weight from 9 to 65 tons.

A typical VULCAN record.

Vulcan Iron Works
1754 Main Street
Wilkes-Barre, Pa.

"Very Satisfactory"

is what Holbrook & Skinner say of

The BAY CITY LOADER

For Pit and Quarry Service

This machine is in operation loading gravel at their plant in Lansing, Mich. It is rendering excellent service and Mr. Skinner most willingly said so.

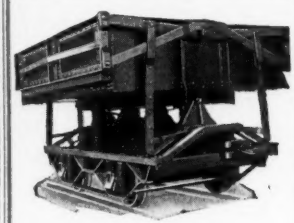
The BAY CITY Loader operates a powerful digging bucket that takes a big load at every bite. Handles a large amount of material at very low cost. Can be used for stripping, grading and loading sand, gravel or clay from bank into cars or wagons. Operating and upkeep costs small.

Write for full description.

BAY CITY DREDGE WORKS

BAY CITY MICH.

Conditions May ..... Cars May But We Don't Differ-



No. 145-Q

at any time from high standards of excellence in car construction and a consistent policy of rendering satisfaction to purchasers of our equipment.

Ours is one of the largest car-building plants of its kind in the world and we can meet your need with dependable, long-lasting haulage cars of a type best suited to your particular kind of work.

Simply state your haulage problem. We'll help you solve it.

No. 77-Q

The Watt Mining Car Wheel Co.

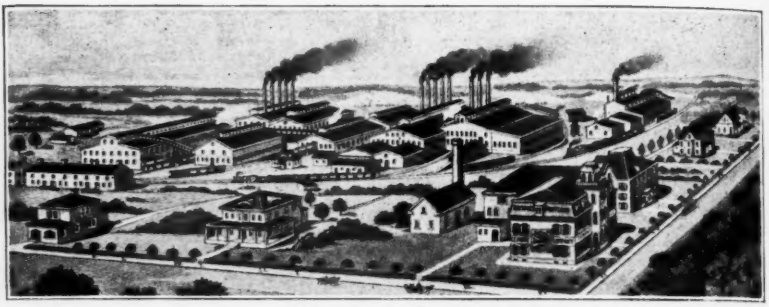
Barnesville, Ohio

Denver:
Lindrooth, Shubart & Co.
Boston Bldg.

San Francisco:
N. D. Phelps
Sheldon Bldg.

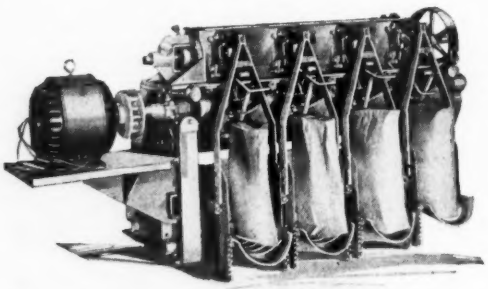
Philadelphia:
Edelen & Co.
235 Commercial Trust Bldg.

Watt Cars



The Tidewater Portland Cement Company

Goods packed by The Valve Bag Company's Packer are acceptable at face weights. Reliable weights satisfy customers.



THE VALVE BAG COMPANY'S PACKER weighs accurately and keeps customers satisfied.

"Weights Are Entirely Satisfactory"

THE VALVE BAG COMPANY OF AMERICA

TOLEDO, O.

Successors to

THE URSCHEL-BATES VALVE CO.

This is BAGGING TALK No. 13. Watch for No. 14.

Is Your Equipment Ready for Spring Work?

With the coming of Spring will also come heavy demands for sand and gravel.

The extent of your business and the profit thereon will depend both upon your ability to furnish material promptly and economically.

By equipping your machines with HERCULES (Red Strand) Wire Rope you will be assured of dependable service and a low operating cost. This statement is not based upon theory, but upon actual results from the time sand and gravel was first handled with steam machinery until the present.

Established 1857

A. Leschen & Sons Rope Company

ST. LOUIS

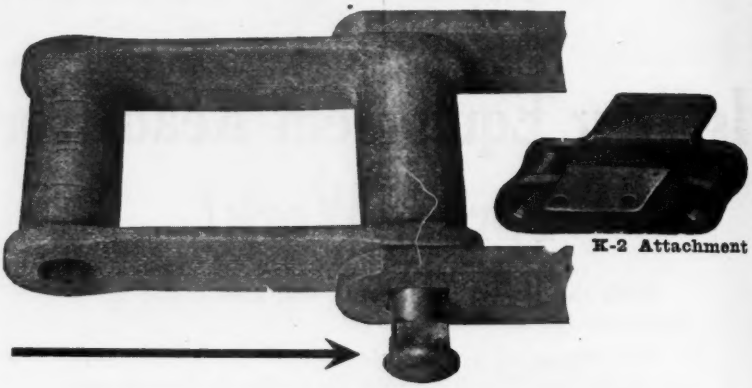
New York **Chicago** **Denver** **San Francisco**

A. LESCHEN & SONS ROPE CO.
ESTABLISHED 1857
ST. LOUIS, U.S.A.

"HERCULES" (RED STRAND) WIRE ROPE

Jeffrey

Square Shank Pin "Hercules" Chain



K-2 Attachment

Here Are Some Advantages of the Jeffrey Square Shank Pin Construction

The hard, smooth **Steel Pins** with the **Square Shanks** fit into perfectly **Square Holes.** The Bearing surface is the **full width** of the pin. There is **no rocking motion in the side bar.**

Steel Side Bars are of high carbon steel—and interchangeable.

The solid cast link is made of high grade malleable iron, both for strength and durability. The long barrel provides extra wearing surface on the rim and the sprocket wheel.

The Square Shank Pins are made as rivets or coupling pins.

The Jeffrey Square Shank "Hercules" Chain is the most economical and substantial chain for service in handling gritty materials and for Heavy Duty Elevators and Conveyers.

We are originators of this type of chain and have been building and improving it for 25 years.

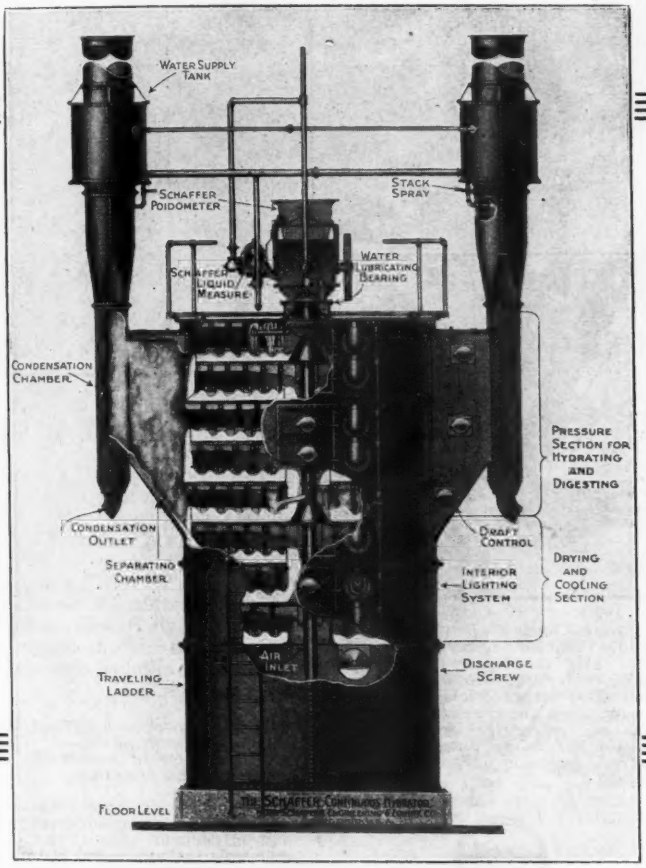
The Jeffrey Mfg. Co. 990 North Fourth St. **Columbus, O.**

BRANCHES:

New York, Philadelphia, Pittsburgh, St. Louis, Dallas, Scranton, Montreal, Boston, Charleston, W. Va.; Cleveland, Chicago, Birmingham, Milwaukee, Denver, Detroit, Seattle, Los Angeles.

A Machine That Wonderfully Co-ordinates

The Essentials of Successful Hydrating

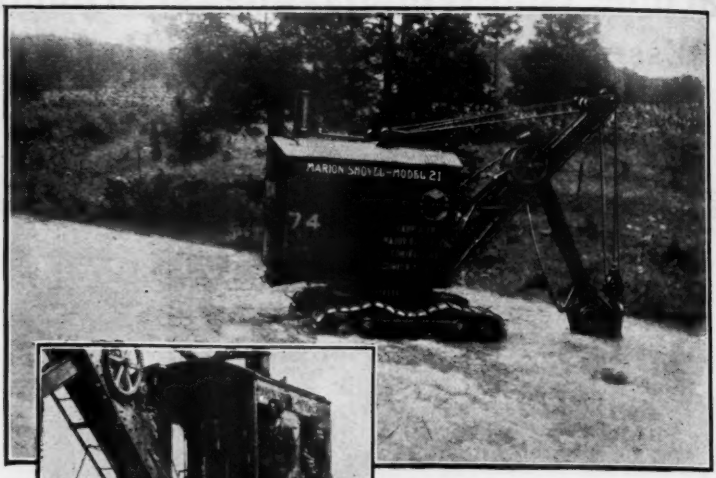


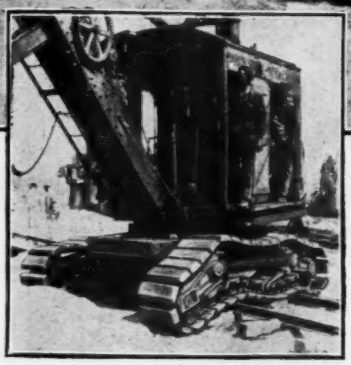
THE SCHAFFER HYDRATOR

Will operate continuously and automatically.
Will produce a superior quality of finished product.
Will operate with entire satisfaction on either high calcium or dolomitic limes.
Will effect a greater saving in labor.
Will permit of the greatest capacity on finishing mills.
Will prevent re-crystallization of very quick limes.
Will produce the greatest percentage of amorphous product.
Will give flexibility in operation to meet any market conditions.
Will properly co-ordinate with other working units of the plant.
Will occupy less space, capacity considered.
Will consume less power, capacity considered.
Will produce a product superior to any competing machine or process.
Will give satisfaction in every way.

THE SCHAFFER ENGINEERING & EQUIPMENT CO.

Peoples Bank Building **PITTSBURGH, PA.**





"Marion Crawlers" fit the road—no matter whether rough or smooth, they keep the Shovel going right along. And they absorb the twist instead of throwing it on the mechanism, even in extreme cases like this one, where the weight of the Shovel has to be distributed over several points of contact with the ground.

Never mind about a bridge!

Here's an example of "the shortest way home"—one that these "Marion" owners won't soon forget. Messrs. Carpenter, Major Bros. & Co., Inc., Clifton Forge, Va., took this picture while their "Marion" was crossing a stream scattered with rocks 12 to 14 inches high. The Crawling Traction Trucks didn't dodge them either—just climbed over and went right through.

"Marion" Shovels mounted on crawlers will go practically anywhere. All of our standard revolving models can be furnished with this mounting.

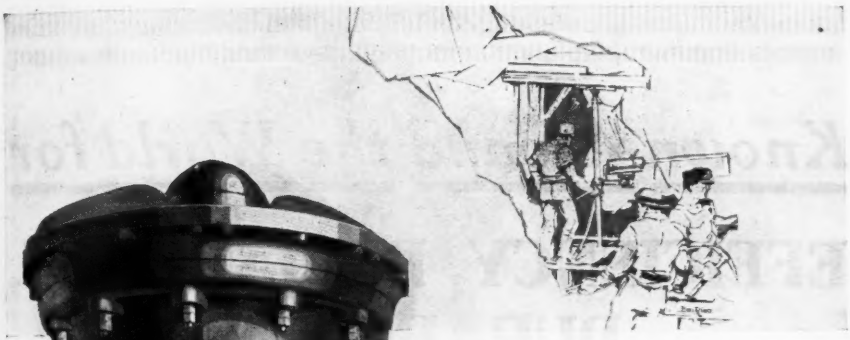
The "Marion" plant is now running "quantity production" on certain types of Shovel most in demand. Our output of these has been greatly increased and deliveries speeded up. Write us in detail about *your* work and we'll tell you when a suitable "Marion" will be ready—we'll furnish estimates and full particulars, too.

The Marion Steam Shovel Company

Established 1884 **Marion, Ohio**

New York *Chicago* *Atlanta* *San Francisco*

Marion



Worthington built the first Suspended Shaft Gyratory

1904—Worthington built the first No. 10 Standard Gyratory.

1909—Worthington built the first 10-inch Superior Gyratory.

Worthington pioneered in large Gyratory and Jaw Crusher construction.

Worthington Superior Suspended Shaft Gyratory is the original machine of its type, was designed and built by Worthington years in advance of competing machines and has proved successful in over 250 installations ranging in size from 10-inch to 36-inch openings.

Tell us your requirements, and we will offer a machine to suit your needs. Superior McCully is built in sizes from 10-inch to 60-inch openings; capacities from 30 to 1,500 tons per hour. Engineering service for crushing plants is freely tendered and without obligation to you.

Send for Bulletin P. M. 50

Worthington Pump and Machinery Corporation

Executive Offices: 115 Broadway, New York City

Branch Offices in 24 Large Cities

Oiling System

"Superior" lubrication is force-feed by means of spur geared oil pump under constant head of oil, positively delivering ample supply at all times to eccentric bearing and gearing. This force-feed cannot be compared with systems using plunger pump and check valves which are often unreliable.

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Deane Works, *Holyoke, Mass.*
Blake & Knowles Works
East Cambridge, Mass.
Worthington Works
Harrison, N. J.
Epping-Carpenter, *Pittsburgh, Pa.*
Laidlaw Works, *Cincinnati, Ohio.*
Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works
Cudahy, Wis.
Snow-Holly Works
Buffalo, N. Y.

Known Around the World for

EFFICIENCY, RELIABILITY, DURABILITY

Complete WASHING and CRUSHING Plants

ALSO

STEAM TURBINES
STEAM ENGINES
OIL ENGINES

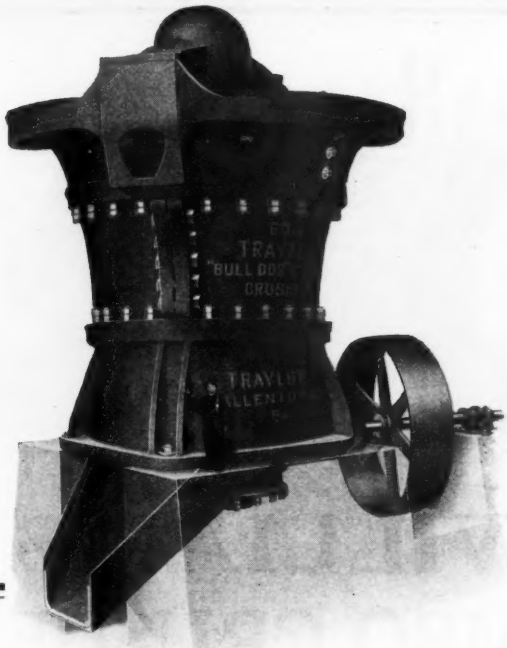
CENTRIFUGAL PUMPS
GENERATORS
MOTORS

ALLIS-CHALMERS

MANUFACTURING CO., MILWAUKEE, WIS.

OFFICES IN ALL PRINCIPAL CITIES

For All Canadian Business, Refer to
CANADIAN ALLIS-CHALMERS, LTD.
TORONTO, ONTARIO, CANADA



Real Crushing Economy

The exceptionally low operating and upkeep costs of the "Bulldog" Gyratories are based on sound points of mechanical superiority. Every feature is the outcome of years of study and investigation to eliminate the weak points of the average gyratory.

TRAYLOR
"Bulldog" Gyratory Crushers

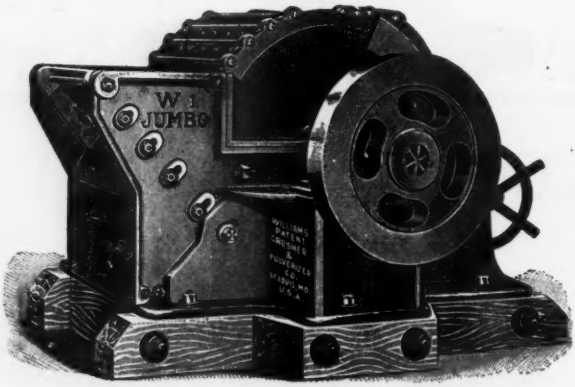
have achieved that ideal. The Bend-Proof Shaft—the Hewes Spider—the larger eccentric—the perfect lubrication—the cut steel gears—every "Bulldog" feature means the utmost of economy in your crushing.

For detailed information—
BULLETIN QGX-1

Traylor Engineering & Mfg. Co.

Allentown, Penna.

NEW YORK 30 Church St. **PITTSBURGH** 211 Fulton Bldg. **CHICAGO** 1414 Fisher Bldg. **LOS ANGELES** Citizens Bank Bldg. **SPOKANE** Mohawk Block



WILLIAMS JUMBO CRUSHERS

Williams Jumbo Crushers are used in quarries as secondary crushers, taking 10-inch and under limestone, as it comes from the primary crushers, and reducing the material to 1½-inch, 1¼-inch or 1-inch and under in one operation. These machines are built in capacities ranging from 30 tons to 300 tons per hour. Many are now in operation. Complete details concerning these crushers are found in bulletin No. 85-A.

The Williams Patent Crusher & Pulverizer Company
General Sales Dept., 37 W. Van Buren St.,
CHICAGO

Plant
ST. LOUIS

67 Second St.
SAN FRANCISCO

Independent Haulage

The Motor Route to Business Success

DON'T BE A SLAVE!

The ordinary contractor for sand, gravel and stone is subject to two kinds of slavery: slavery to the whims and uncertainties of the railroads; slavery to the irresponsible team drivers who while away their time in secluded spots where good fellows get together.

There may be other kinds. But these two are sufficient to make him rise up in rebellion.

And, as history has shown us many a time, freedom is nearer than he had thought.

The Motor Truck makes him master of his business, molder of his own destiny.

He thus makes his own limitations, and does not have them imposed upon him by an outside power.

Neither the Car Service Section nor the Teamsters' Union has any terrors for him.

He is the man who has thrown off his fetters and is going to make good on his contracts, regardless!

Many readers of PIT AND QUARRY have been thus emancipated. Others are rapidly learning the ways of freedom and successful business by the Motor Route.

Some of them will tell of their experiences from time to time in these pages.

In the sand pit. Which is surest to deliver the goods—the average assembled truck or the Packard with its 84 per cent of power at the rear wheels in low gear, and its ability to climb a 28 per cent grade

Which Contractor Is Surest of a Fair Profit

WHAT keeps the contractor guessing these days is the uncertainty of men and materials.

He can figure to an hour when a job *ought* to be finished, but he can't foresee the defects in a truck that may at any time tie up deliveries and delay the work.

The contractor who appreciates the vital importance of getting the right truck is going beyond mere claims or demonstration runs.

He is looking for a truck of uniform quality throughout—not an assembly of uncertain parts from unknown sources—but a transportation unit built from the ground up by one responsible organization.

When he buys a Packard Truck he knows that it is constantly dependable—that it assures the delivery of materials on time—every time.

Packard owns and operates the most extensive heat-treating plant in the world—producing a steel that is stronger than the average by 35,000 to 62,000 pounds to the square inch.

The Packard business is a business of building trucks for the man who wants *transportation* every working hour of every working day. The contractor who realizes the vital importance of that kind of transportation is surest of a fair profit.

"Ask the Man Who Owns One"

PACKARD MOTOR CAR COMPANY, *Detroit*

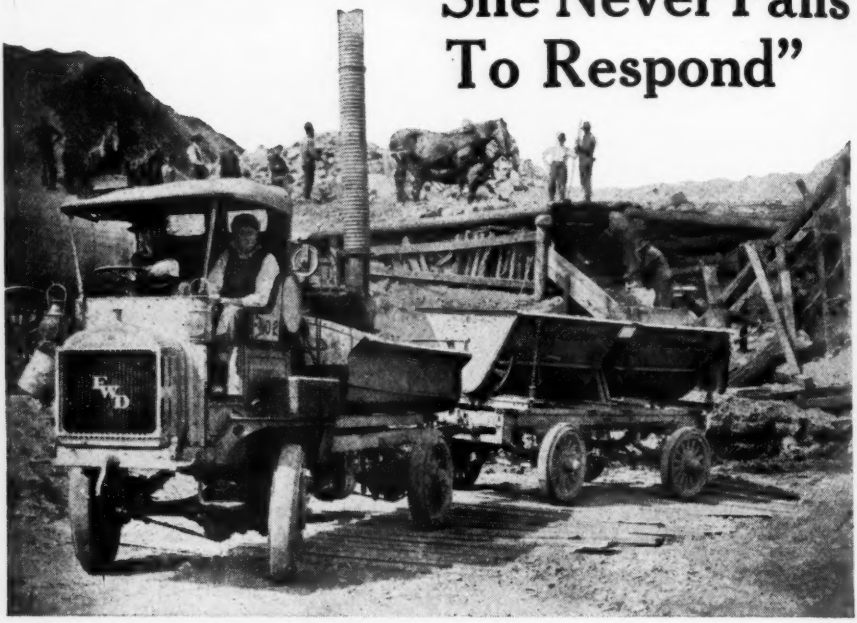
140 H. P. Lombard Auto Tractor-Truck

Speed—**6 miles** per hour with 30 tons. The all year-'round machine which hauls big loads through two or **three feet of snow** and mud and in places where there are no roads and other trucks and tractors cannot take a load at all. You can deliver materials in the Winter and Spring when you ordinarily would not attempt to make deliveries at all. This enables you to increase your output and satisfy your customers by having the materials there when they need them. If you can make deliveries when your competitor cannot, or your **railroad has an embargo on,** or you **cannot get cars** to ship in, **you** get the business.

Lombard Auto Tractor Truck Corp.

New York City **U. S. A.**

"She Never Fails To Respond"



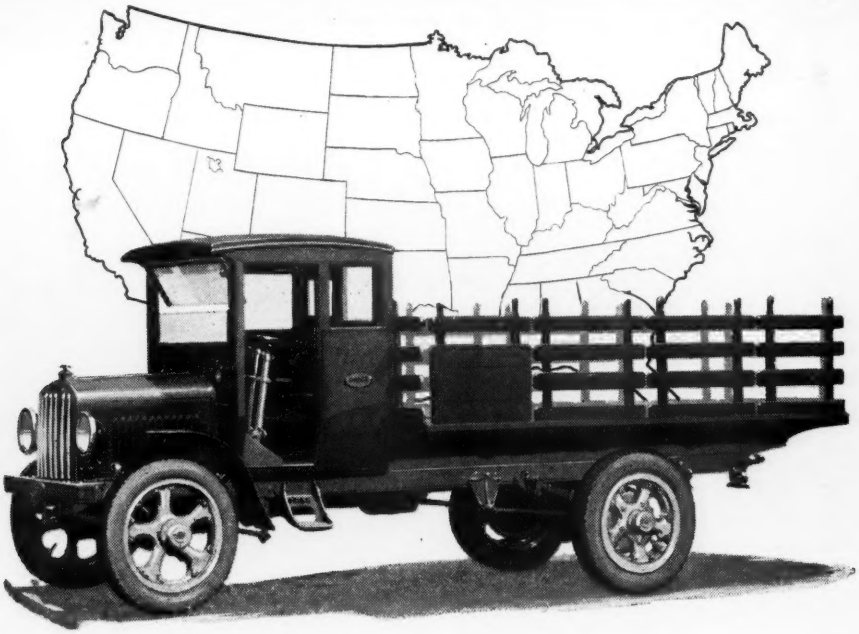
Two FWD Trucks are operated by the Iron County (Mich.) Road Commission. H. F. Larson, county road engineer, writes: "We use the FWD for all sorts of work, such as scarifying, pulling a road grader, oil distributor, and crushing plants. We never lost a day on account of an FWD breaking down, and she never failed to respond to the hardest use. We intend to operate the FWD with trailers for hauling gravel and stone."

The exceptionally short over-all length without any sacrifice of load carrying space, the small turning radius, and standard 56-inch road tread, makes getting in and out of sand and gravel pits and other cramped quarters easy work for the FWD.

FWD TRUCKS

The Boys from the Front will tell you

The Four Wheel Drive Auto Co.
Dept. 114 Clintonville, Wis.
Canadian Factory: Kitchener, Ont.



Backed by Nation-Wide Service

We can safely predict that our new one-and-one-half-ton Paige will win for itself the same measure of approval that has been enjoyed by all other products in the great Paige line.

For this latest model will have behind it the same factors that have made for the success of its companions in the Paige truck family—thorough mechanical excellence, supplemented by a nation-wide service organization the sole purpose of which is to maintain that original excellence day in and day out

As the owner of this new Paige, therefore, you will have not only the satisfaction of possessing a truck that is strongly and excellently built but also the comforting assurance that, wherever you may drive, you will always be within a zone of Paige service, should mishap occur.

The reputation of Paige as an institution of ten years' standing is inseparably connected with every truck bearing the Paige nameplate. With so much at stake, we naturally see to it that every Paige truck makes good even beyond the expectations of the purchaser.

PAIGE-DETROIT MOTOR CAR COMPANY, DETROIT, MICHIGAN

Manufacturers of Paige Motor Cars and Motor Trucks

PAIGE

The Most Serviceable Truck in America

MOTOR TRUCKS

DUPLEX TRUCKS

BUILT FOR BUSINESS

Why The Duplex Limited Is Winning Enthusiastic Approval All Over America

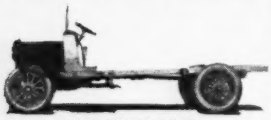
Without question the remarkable success of the Duplex Limited is due to the confidence that truck users all over America have in the Duplex Truck Company as builders of trucks that a business man can consider an investment in practical trucking efficiency.

What does the steady, persistent growth of the Duplex Truck Company signify as regards this Duplex Limited?

For one thing it means that the Limited is designed and built by a company that is **known to be successful**—a company that is famous for building good trucks.

Medium Capacity—Two-Wheel Drive—Complete Electrical Equipment—Pneumatic Tired — **High Speed**—it is a wonderful truck for general business hauling.

Talk to the Duplex dealer in your vicinity. Find out for yourself why the Duplex Limited already is known as a very safe investment for a business man.



DUPLEX BUILT FOR BUSINESS

Experience Has Found No Equal to The Duplex 4-Wheel Drive in the Hauling of Stone, Sand and Cement

There is just one answer to the universal preference you find for the Duplex 4-Wheel Drive wherever there are heavy dead weight loads to be hauled.

And that is the "All-Wheel" pull of the Duplex 4-Wheel Drive—plus the fact that Duplex trucks have been especially designed to transport dead weight loads under conditions that are ordinarily beyond the capacity of any other kind of motor truck.

The draw-bar pull of the Duplex 4-Wheel drive is 4 times that of the other truck, because it exerts double the leverage.

Instead of the rear wheels pushing the load with its inertia of dead weight and passive front wheels, every wheel on the Duplex exerts its power and carries its proportion of the load as long as front or rear wheels get traction.

Because every wheel works all the way in level going to overcome the inertia of dead weight, Duplex hauls more economically on every road—be it grade or level.

The front wheels of the Duplex 4-Wheel Drive pull while the rear wheels push. The result is minimum wastage of power and maximum dependability in delivering the load.

Business is coming more and more to deal with certainties and not impressions in motor transportation. And the stronger this viewpoint obtains, the more apparent becomes the superiority of the Duplex 4-Wheel Drive.

The facts of Duplex double leverage and four-fold pulling power are in the hands of every Duplex dealer. You will find they will convince you beyond dispute as to the advantages of Duplex 4-Wheel Drive for hauling stone or gravel, sand, and cement, and other loads of similar character.

Duplex Truck Company

Lansing • Michigan

One of the Oldest and Most Successful Truck Companies in America

Quality TANKS BODIES & HOISTS "Made by Heil"

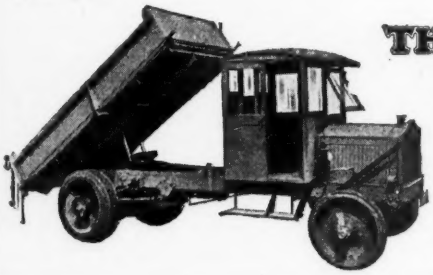
Why Specify Dump Bodies and Hoists?

Because, certain types of bodies are better adapted for hauling certain materials than others;

because, certain hoists increase your loading space and the ease of handling your product;

because,—but write for **circular 110 and 112.** They talk the matter over with you.

Years in the Steel Body game have given us some pointers which we want to pass on to you—and you should know them. Let us hear from you.



THE HEIL CO.

Offices 1139 Montana Ave., Milwaukee.

Branches & Service Stations

2718-20 Wentworth Ave., Chicago, Ill.

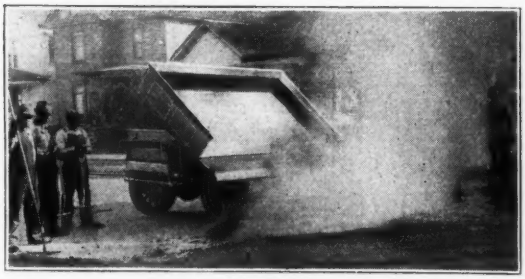
Pelham & St. Anthony Avenues, St. Paul, Minn.

Holden and Greenwood Avenues, Detroit, Mich.

DEALERS

Get after the Side-Dump Body Business, and increase the output of Trucks.

with a



Side View

AUTOMATIC SIDE DUMP BODY

To increase the Sales of Trucks put on a Side Dump Body and watch your Business Grow.

Dumps in any weather.
No lost space back of driver's seat.
Can't break down and get out of order.
Will outwear any truck.
Dumps a 3-yard load in a minute and half.
Dumps all the load off without operating Truck.

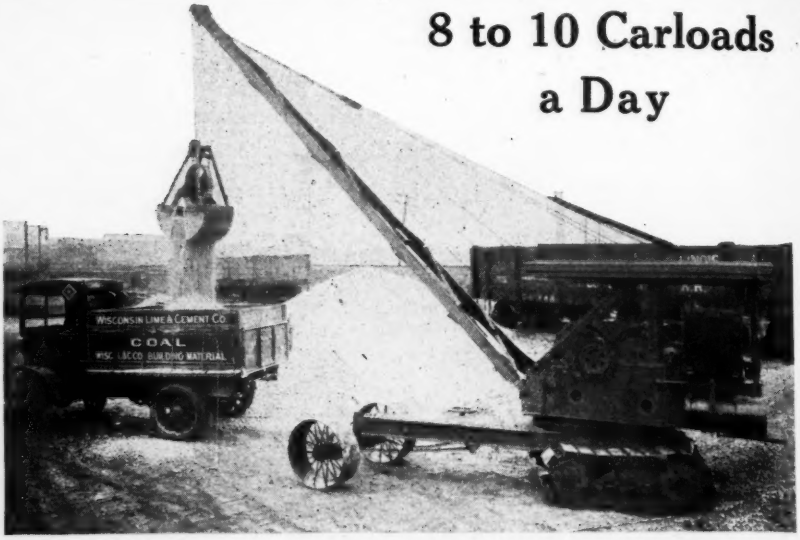
Fits any Chassis.

Write for attractive Dealers' Contract.

AUTOMATIC DUMP CAR COMPANY

1600 Ernsperger Street Sales Dept. A. SOUTH BEND, IND.

8 to 10 Carloads a Day



THAT is what one Chicago concern, the Wisconsin Lime & Cement Co., is doing with a P & H Excavator Crane—unloading 8 to 10 carloads a day, with a man in charge who is not a high-priced licensed engineer.

The P & H requires no propping or stabilizing, and can be shipped without dismantling.

And it will do many things beside unload sand, gravel, crushed rock, and other loose materials.

Get the whole story in our Bulletin 5X.

PAWLING & HARNISCHFEGER CO.

50 Church St., New York
704 Stephen Gerard Bldg., Philadelphia
926 Whitney Central Bldg., New Orleans, La.
47 Fidelity Bldg., Pittsburgh, Pa.

EST. 1884

MILWAUKEE, WIS.

1241 Monadnock Block, Chicago, Ill.
Pittock Block, Portland, Ore.
1125 Central Bldg., Los Angeles
821 Monadnock Bldg., San Fancisco.

P&H — excavators — back-fillers - tampers

TELSMITH—

The Crusher with the Parallel Crushing Stroke

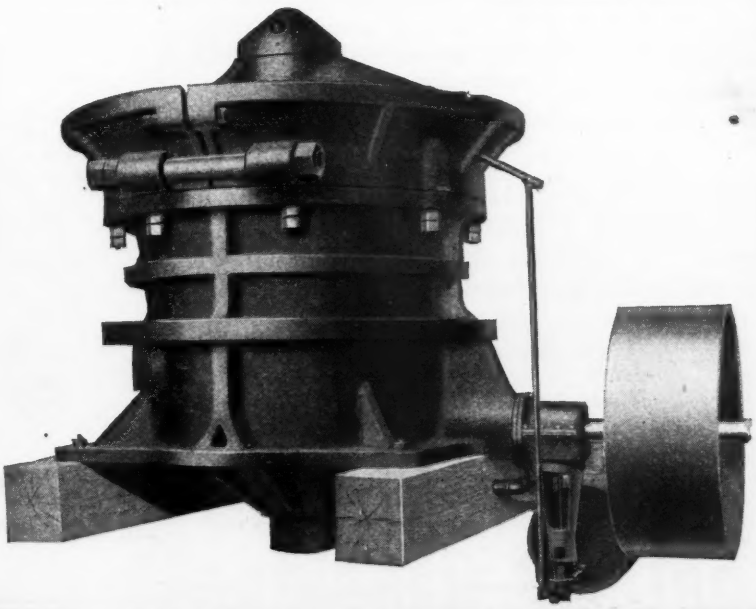
Do you want information about the Telsmith pillar-shaft, short structure, big feed openings and parallel crushing stroke? Go to the ULTIMATE AUTHORITY—the user. Here are the names of a few people who work with Telsmith and regard him as an old, reliable henchman:

Defrain Sand Co., Philadelphia, Pa.
Thomas Iron Co., Wharton, N. J.
Charles Warner Co., Wilmington, Del.
E. J. Lavino Co., Philadelphia, Pa.
Thomasville Lime & Stone Co., Thomasville, Pa.
Standard Chemical Co., Canonsburg, Pa.
Webster Stone Co., Irvington, Ky.
W. F. Woodruff, Louisville, Ky.
Nashville Ry. & Light Co., Nashville, Tenn.
Quenelda Graphite Corp., Linneville, Ala.
United Railways Co., St. Louis, Mo.
A. R. Young Const. Co., Little Rock, Ark.
Federal Lead Co., Flat River, Mo.
Stringtown Crushed Rock Co., McAlester, Okla.
Penn Iron Mining Co., Vulcan, Mich.
Hilder Granite Co., St. Cloud, Minn.
Story Rock Co., Bozeman, Mont.
Pacific Mines Corp., Ludlow, Calif.
Phelps-Dodge Corp., Tyrone, N. Mex.
United Eastern Mining Co., Oatman, Ariz.
Rand Consolidated Mines Co., Goudreau, Ont.
Teck Hughes Gold Mining Co., Cobalt, Ont.
Dept. of Highways, Toronto, Ont.

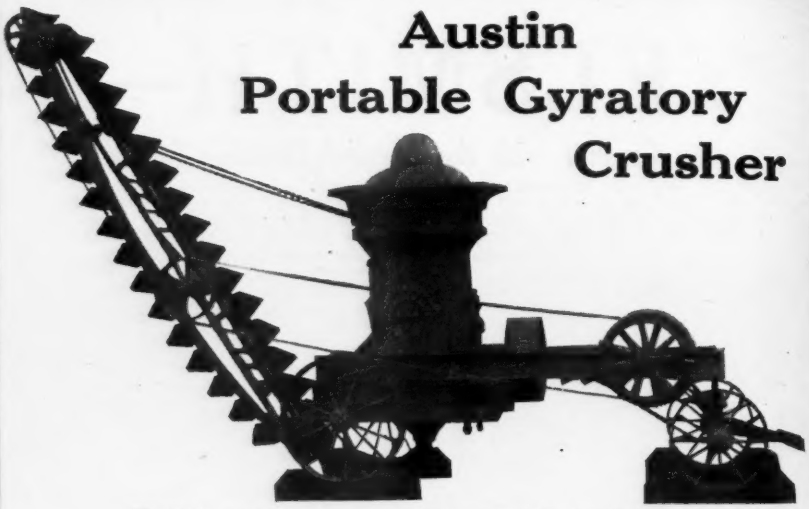
An inquiry to any one of the above will bring to you volumes more about Telsmith equipment than can be told in the most imposing advertisement. Glad to send you our catalog No. 161 Telsmith Primary Breakers and Bulletin No. 2-F-15 (Telsmith Reduction Crushers).

SMITH ENGINEERING WORKS

3183 Locust St., Milwaukee, Wis.



Austin Portable Gyratory Crusher



THIS machine is a "husky"—one that invites your study. Designed to render hard and continuous service under all conditions. A real profit maker.

Some Exclusive Features—

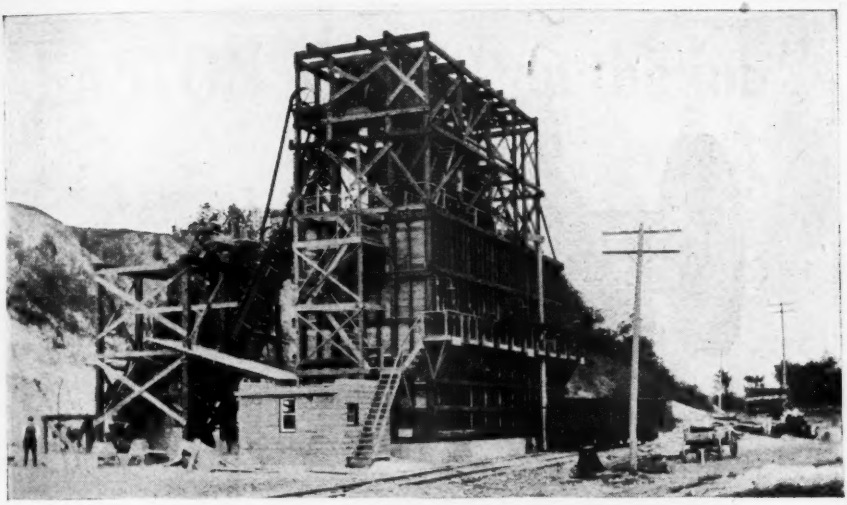
1. Automatic oiling system.
2. Rigid eccentric bearing.
3. Size of rock receiving aperture constant—even after adjustments for wear.
4. Countershaft supported each side of driving pinion.
5. Full eccentric bearing surface retained—even when head is raised.
6. Working parts thoroughly protected from dust and dirt.

If you have rock to crush you cannot afford to delay in learning about the Austin crushers. Write for literature.

Austin Manufacturing Company

New York CHICAGO San Francisco

EXPORT DEPARTMENT
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA



Plant of the Eikhart Sand and Gravel Co., Elkhart Lake, Wis. Capacity, 1,600 tons per day of 10 hours.

Complete gravel crushing, screening and washing outfits

Branch Offices

Boston, Mass.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Atlanta, Ga.
Knoxville, Tenn.
Louisville, Ky.
Chicago, Ill.
Minneapolis, Minn.
Portland, Ore.
Kansas City, Mo.
Fort Wayne, Ind.
Muskogee, Okla.
Denver, Colo.
Billings, Mont.
Boise, Idaho
San Francisco, Calif.
Los Angeles, Calif.

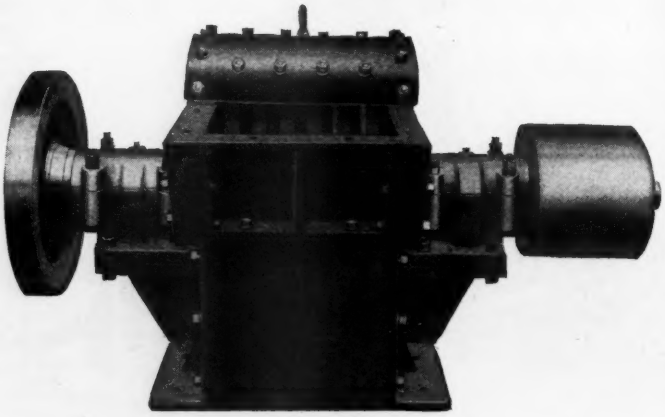
We plan and build complete gravel crushing, screening and washing outfits for every purpose.

The successful operation of such plants is guaranteed because the machinery installed is designed and manufactured entirely in our own factories.

Screens are of the non-clog type. All the sand or gravel is thoroughly washed, evenly sized and delivered exactly as desired. Write for catalog containing full particulars of excavating, elevating, conveying, crushing, screening and washing equipment.

General Sales Offices
833 Bulletin Building, Philadelphia, Pa.

The GOOD ROADS Machinery Co., Inc.



Quarry Owners

250,000 tons of pulverized limestone were used last year in the State of Ohio alone. Ten times that quantity could be used by Ohio farmers with profit.

With more than 6,000,000 farms in the United States, and the farmer realizing the value of limestone as a fertilizer, millions of tons will be used throughout the country this year.

Prepare for this great demand—this opportunity for increased profits—with the most reliable Pulverizer built.

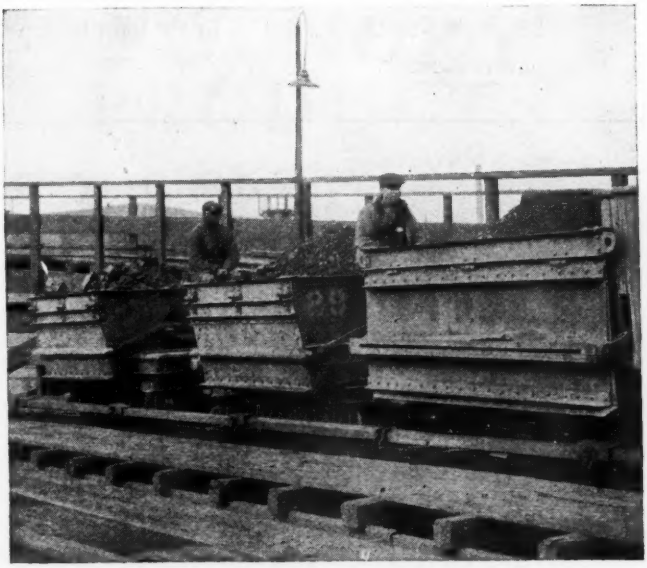
The Gruendler Automatic is a powerful mill, lasts a lifetime, is economical to operate and maintain, and has a greater grinding area and a larger capacity per horsepower than any other pulverizer.

Built in standard sizes of 3 tons to 600 tons daily capacity. Write for literature and full particulars.

Gruendler Patent Crusher & Pulverizer Co.

987 North Main St. **St. Louis, U. S. A.**

EASTON CARS "on the job"



EASTON INDUSTRIAL CARS

Complete Equipment

We are more than just car builders—we are also designers and builders of complete industrial Railway Equipments.

Our twenty-five years' experience and the skill of our engineers in charge of designing and manufacturing guarantees the successful and economical operation of all Easton Equipments.

Whether your present requirements demand merely a single car, Turntable or Switch, or a complete Industrial Railway Installation, you will find us ready to serve you **promptly.**

Tell us your present needs and we shall be glad to have our nearest representative consult with you. Catalog?

EASTON CAR & CONS'T'N CO.

EASTON, PA.

There are many excuses for not belonging to the A. B. C. There is only one **reason.**

EVERY DOLLAR spent for advertising in a publication which misrepresents its circulation and thus obtains money under false pretenses is a dollar lost to the publishers who give full value. But more than that—it is a dollar misspent by the advertiser and for which he does not get a dollar's value.

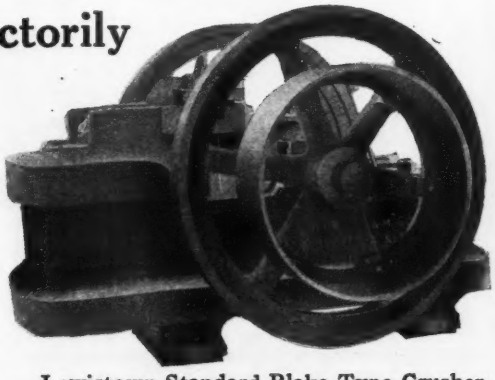
In their own defense, therefore, the "above board" publishers have an independent audit made of their circulation records by the Audit Bureau of Circulations, and invite their competitors to do likewise.

When excuses or evasions are given for declining the challenge, the advertiser can draw his own conclusions.

PIT AND QUARRY is a member of the Audit Bureau of Circulations. There are no hidden mysteries about its circulation records.

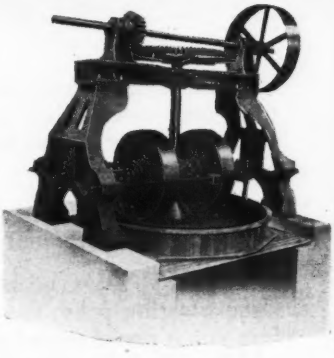
LEWISTOWN FOUNDRY PRODUCTS

Will satisfactorily meet your
CRUSHING
GRINDING
SCREENING
WASHING
DRYING
ELEVATING
needs



Lewistown Standard Blake Type Crusher

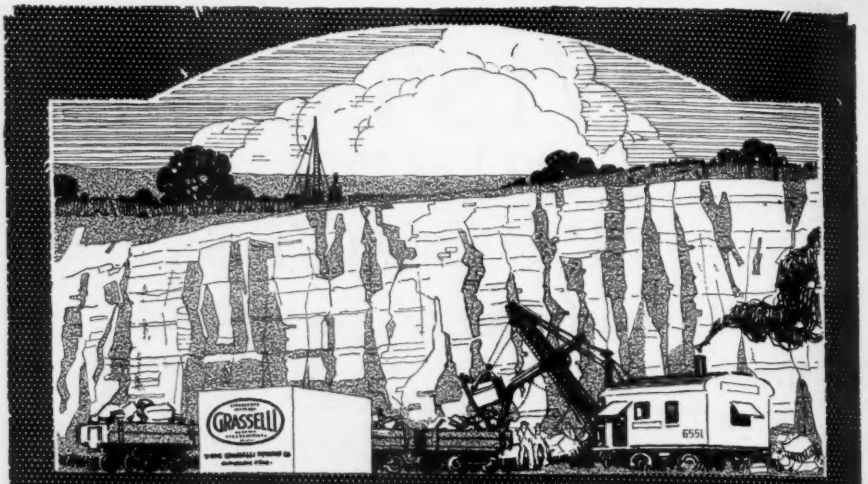
We manufacture a line of equipment for the above purposes in pit and quarry service and shall be pleased to furnish you with any desired information on whatever class of equipment you are interested in.



9-Foot Dry Pan

40-ft. Continuous Bucket Elevator

LEWISTOWN FDY. & MACHINE CO.
LEWISTOWN, PA.



GRASSELLI EXPLOSIVES

Pit and Quarry operators today realize that efficient man and mechanical power make the success of the stone industry possible only when efficient explosives are used.

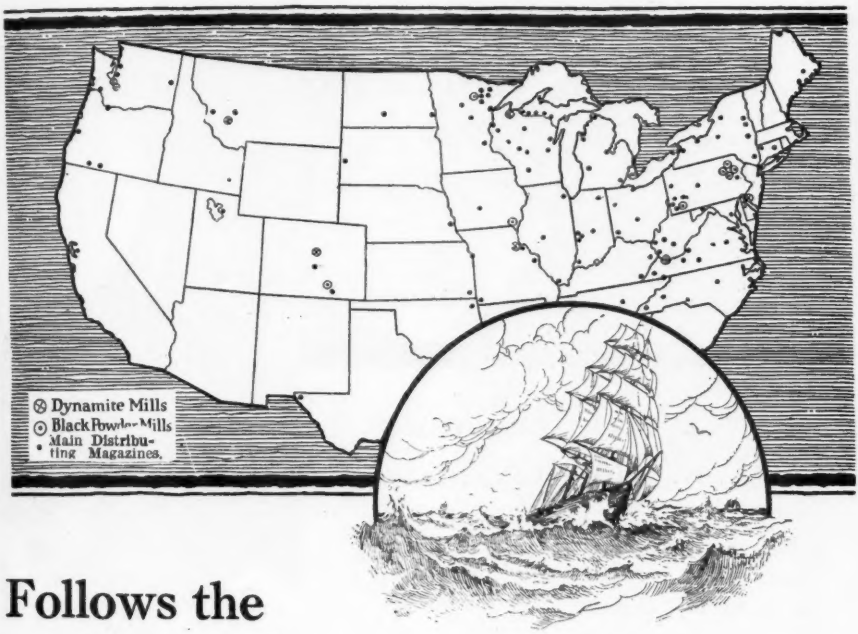
"Grasselli" quality explosives have proved themselves to be the most efficient explosives science can produce.

Backed by years of practical experience in directing huge blasting jobs, the Grasselli Powder Company offers you a powder and a service of demonstrated value, which will help you to increase production and cut down operating expenses.

Let one of our engineering experts work with you in solving your blasting problems. Write for further information regarding "Grasselli" Service. We will be glad to reply promptly and in full detail.

THE GRASSELLI POWDER CO.
CLEVELAND, OHIO

Du Pont Explosives Service —*Everywhere*



Follows the Demand—

Around the Horn in '49

Around the Horn in '49, in stately square riggers, went Du Pont Explosives to help release the golden treasure of California. Only a few months later a Du Pont magazine was built in what is now the heart of the business section of San Francisco. Today four great Du Pont mills, centrally located, are supplying the demands of the Pacific Slope.

Ever since 1802, the Du Pont Company has followed and kept pace with demand until today we operate 24 mills and maintain a great number of magazines strategically located throughout all the great industrial sections of the country.

No matter where your business is established, Du Pont Explosives and Du Pont Service are at your elbow. And by Du Pont Service we mean the quick delivery of the particular type of explosive that will give the best results at least cost *for your particular work*, and full co-operation in establishing proper methods of handling, storage and use.

Write us about your problems. "Du Pont can do it, or it can't be done."

DU PONT

E. I. du Pont de Nemours & Company, Inc.

Sales Dept.: Explosives Division

WILMINGTON, DELAWARE

"Hercules Dynamite Will Do the Job"

You'll hear this from thousands of men In the mines, in the quarries, on engineering jobs of all sorts—they all know Hercules Powders—and *know that they make good*

Hercules Dynamite can help *you* in *your* work. No matter whether you are mining coppe ore, getting out road ballast, digging an aqueduct or grading a highway, one or another of the many formulas or grades of Hercules Powders will fit your needs. *These powders will speed up work and cut costs.* They have done it for others and will do it for you.

If you think we can help you with any of your blasting problems, write us. Our service staff is always ready to give you any information that will help you in your work.

HERCULES POWDER CO.

Chicago	St. Louis	New York
Pittsburg, Kan	Denver	Hazleton, Pa.
San Francisco	Salt Lake City	Joplin
Chattanooga	Pittsburgh, Pa.	Wilmington, Del.

HERCULES DYNAMITE

Make Every Shot *COUNT!*

WITH PRODUCTION costs mounting higher and higher it is more essential than ever that you make every dollar's worth of explosives do a dollar's worth of work.

All doubt in this direction is set at rest when you use Aetna Explosives. They are manufactured from special formulas designed to give maximum disruptive power. Properly placed and fired, Aetna Explosives bring down the rock in profitable quantity—and shattered to the desired size.

Aetna Explosives, moreover, being uniform in quality, can always be depended upon to give the same results.

Aetna Explosives are most effective when used with Aetna Blasting Supplies.

Write for full particulars

Aetna Explosives Company, Inc.

165 Broadway, New York

BRANCHES

Birmingham, Ala.
Buffalo, N. Y.
Chicago, Ill.
Denver, Co'o.
Duluth, Minn.
Joplin, Mo.
Louisville, Ky.
Norristown, Pa.
Pittsburgh, Pa.
Pottsville, Pa.
Roanoke, Va.
St. Louis, Mo.
Wilkesbarre, Pa.

AETNA

It does the work!

DU PONT

BLASTING CAPS
ELECTRIC BLASTING CAPS
DELAY ELECTRIC BLASTING CAPS
FUSE
BLASTING MACHINES
DELAY ELECTRIC IGNITERS
GALVANOMETERS
RHEOSTATS
LEADING WIRES
CAP CRIMPERS
TAMPING BAGS
THAWING KETTLES

Blasting Accessories
—*for Better Blasting*

THE success of any blasting operation is largely dependent upon the detonating materials used. Be sure the Du Pont Label is on your Blasting Accessories as well as on the explosive container itself and you know you are right.

118 years of manufacturing and research in the field of explosives has enabled the Du Pont Company to develop the most efficient and most economical accessories for putting them to work.

Write today for our booklet, "Blasting Accessories." Every user of explosives needs a copy.

E. I. du Pont de Nemours & Company, Inc.
Sales Dept.: Explosives Division
WILMINGTON, DELAWARE

11640

QUARRY

GENERAL EXPLOSIVES COMPANY

72 WEST ADAMS STREET

CHICAGO

JOPLIN, MO. ST. LOUIS, MO.

BIRMINGHAM, ALA.

EXPLOSIVES

The New B-G Loader

Model 20

Full length crawlers, 58" long by 8" wide make it possible for this new B-G Self-Feeding Bucket Loader to operate under any and all conditions. Especially in sand and gravel pits where the footing is poor is this new feature of the greatest importance.

Many Other Features

The patented rotating disc feeder remains nearly the same as on all the older B-G machines —but with a few improvements — 4 cylinder truck engine — one man control—best of materials and workmanship throughout.

And remember this fact, that Model 20 is not an experiment, but is simply a new and better machine built by the pioneers in the material handling machinery field. B-G engineers will gladly work with you. Tell us your problems and get a copy of Catalog N.

Barber-Greene Company

AURORA, ILLINOIS, U. S. A.

BRANCH SERVICE AND SALES OFFICES:

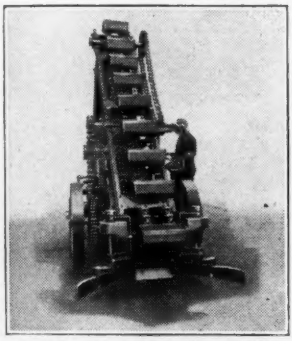
New York	Hartford	Detroit	Chicago	St. Louis	Salt Lake City	New Orleans
Philadelphia	Buffalo	Indianapolis	Milwaukee	Omaha	Los Angeles	Tampa
Norfolk	Louisville	Pittsburgh	Minneapolis	Kansas City	San Francisco	Savannah
Salem	Cleveland		Denver		Portland	Utica

Southern Branch: Birmingham, Ala. Canadian Agents: Massens Limited, Montreal, Winnipeg, Toronto, Vancouver

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA

AUSTIN

Wagon Loader



Ready for Operation with Digging Arms Extended.

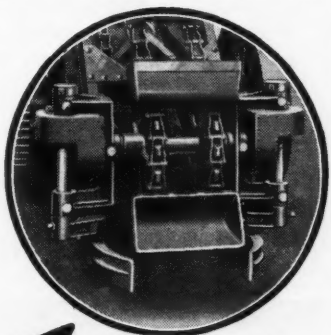
feeds itself

The Austin Patented Self-Feeding Device is the greatest improvement since the introduction of mechanical wagon loaders. The feeding arms push the material directly into the path of the buckets, keeping them full. The increase in efficiency makes the Austin Loader an extremely profitable investment.

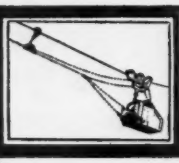
Self-propelled loader of the multiple-bucket type. Travels forward or backward. Neither buckets nor feeders have to be stopped, whether backing or going straight ahead.

Unequalled for general quarry work. Send for catalog and descriptive literature. W-L-16.

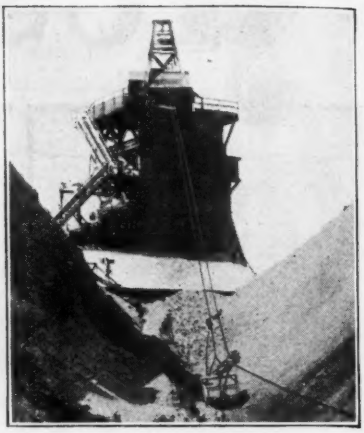
F. C. Austin Machinery Co.
Railway Exchange Bldg.
CHICAGO, ILL.
D. L. 116
New York Office
30 Church Street



The Arms That Dig. In Feeding Position.



SAUERMAN
DRAGLINE CABLEWAY EXCAVATORS



A Few Points to Remember

It is not so difficult to decide what type of equipment is best adapted to your particular sand and gravel proposition if you will bear a few points in mind.

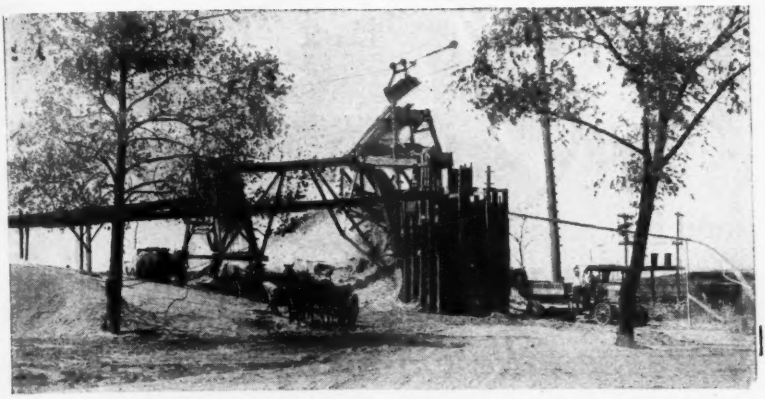
Just remember that a Sauerman Dragline Cableway Excavator will dig over long spans and as deep as ordinary gravel runs, enabling it in most cases to handle the gravel from pit to plant direct without the help of auxiliary conveying equipment.

Remember also that a Sauerman Dragline Cableway Excavator is especially economical and efficient for digging sand and gravel from under water, as witness its frequent use instead of a pump or dredge.

For a specific recommendation on equipment suitable for your operations, write us in detail about your ground conditions, daily output wanted and other requirements of your proposition and we will give you our frank advice.

Sauerman Bros., 312 S. Dearborn St., Chicago.

- dig, convey, elevate & dump in one continuous movement under complete control of one man.



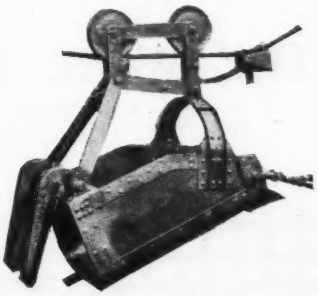
Bigger Production and Profits With Better Gravel Plant Equipment

This is a building year! Throughout the country there is marked activity in road building, bridge building, industrial building, and apartment and home building.

There will be a steady demand for gravel and sand. Plant owners should prepare now for this business. Better plant equipment will bring you bigger production and profits.

The Pioneer Slack Line Excavating Outfit will get your gravel out faster, easier and at less expense. Before you order new equipment, get our catalog and prices and put your excavating problems up to our advisory staff of engineers.

PIONEER
BACK-DUMP
BUCKET

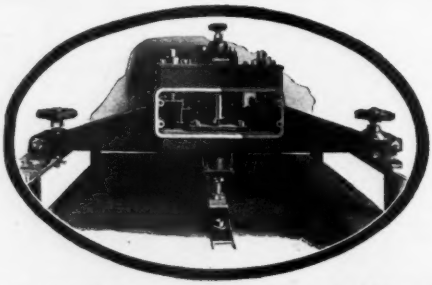


This bucket represents the utmost in efficiency, simplicity and economy. No other bucket will give you the service that the PIONEER offers. Get our facts.

The Mansfield Engineering Co.

Fletcher Savings & Trust Bldg.,
Indianapolis, Ind., U. S. A.

Loads Faster
Dumps Quicker
Uses Less Power
One-Man Control



HUM-MER SEPARATOR

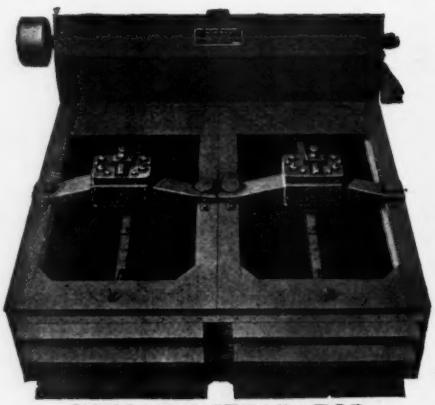
Increases the Capacity of Crushers

The purpose of a screen in handling crushed material is to remove the fines and return the oversize to the crusher for further treatment.

Fine material that goes back to the crusher with the oversize acts as a cushion for the coarse material and greatly reduces the crushing action; furthermore, it must be carried to the screens a second time. Thus the capacity of both the crusher and separator are cut down.

By reason of the electric vibration and "drumhead" tension of the screen cloth, the HUM-MER Separator produces the greatest possible capacity and reduces to a minimum the amount of fine material remaining in the oversize.

Write for full particulars.



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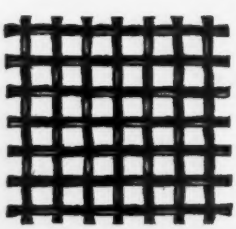
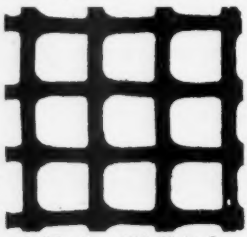
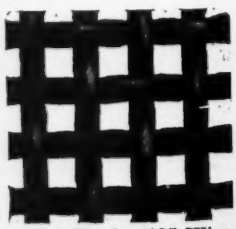


6 Mesh; .054 Wire



3 Mesh; .080 Galvd.



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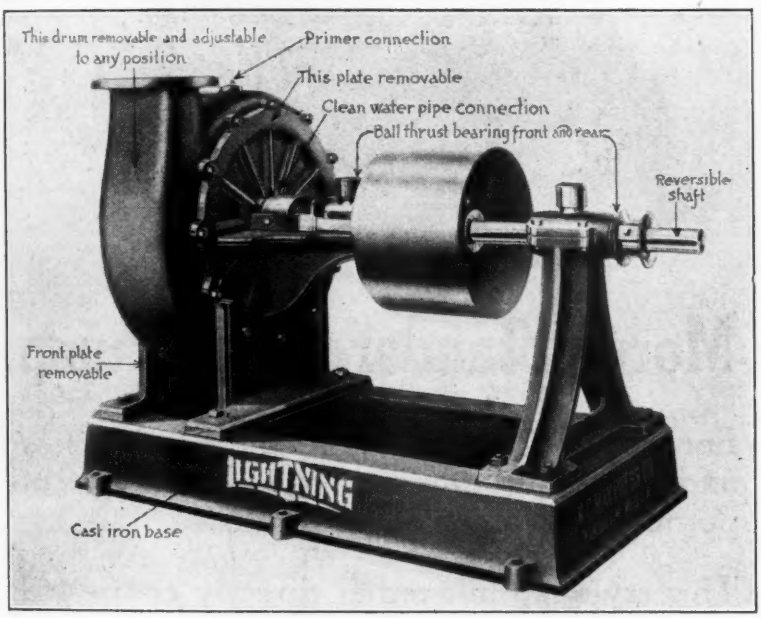

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Kansas City Hay Press & Tractor Company

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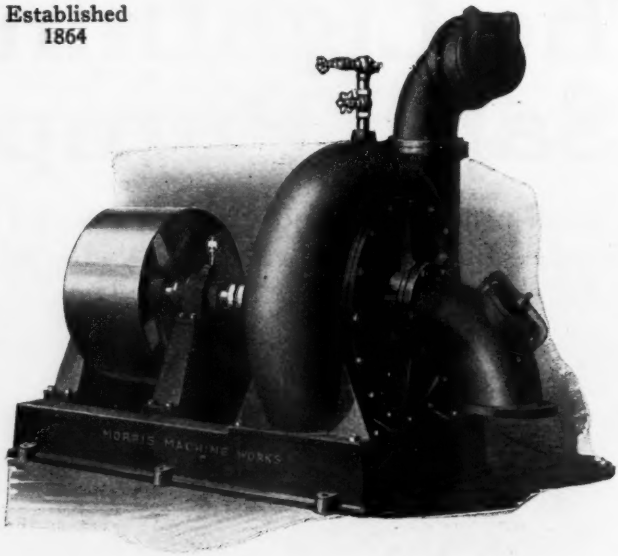
Established
1864



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For ordinary work where the head is low and material light our standard type of pump will give excellent results.

This style is built either directly connected to engine or motor, also belt drive.

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Pit and Quarry

A Monthly Journal for Producers of Sand, Gravel, Stone, Cement, Gypsum and Lime
Member Audit Bureau of Circulations

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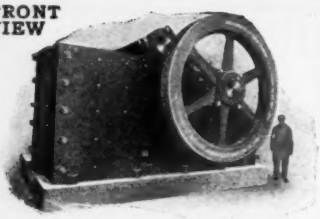

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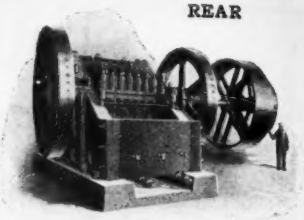

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This machine has given constant satisfactory service and is now still in daily operation. Since that time the Buchanan Crusher has always been the choice of conservative engineers and today there is not one of our large machines but has given entire satisfaction to its owners.

The Buchanan is the Pioneer Large All Steel Jaw Crusher embracing every real improvement in Jaw Crusher design including several patented features.

All BUCHANAN crushers are furnished with our patent adjustable jaw stroke. Water jacketed, removable frame bearings. Jaw plates, toggle bearings and check plates of Manganese steel.

The entire construction excepting the fly wheels is of the very best quality of Open Hearth Steel, heat-treated and annealed. Pitman is parting, spring-balanced and water-jacketed. All joints subjected to strain are machined. Twenty-four sizes in Type "C," from 24x36 in. to 66x84 in. Send for bulletin No. 10. Smaller crushers twelve sizes, ALL STEEL, from 5x12 in. to 24x 36 in. Send for Bulletin No. 9.

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BUCHANAN

ALL-STEEL CRUSHERS

every one a profit earner!

Pit and Quarry

Vol. 4 Chicago, Ill., April, 1920 No. 7

Night Work In Quarries

A LARGE percentage of the crushed stone and lime quarries in the country do not carry on their quarry operations at night for any considerable length of time. When the output is limited by the sales made, and the product turned out during the day equals or exceeds the possible sale, night work is clearly not advisable. Also during the winter season, when weather and other conditions are against production, it is folly to attempt to work at night.

But during six months in the year—from May 1 to the end of October—when the weather is favorable and the nights are comparatively short, and the demand for the quarry products is at its height, many quarries would find it advantageous to work both day and night. In the South, where the weather is milder—even for eight months—it would pay to carry on operations at night.

Those contemplating carrying on their quarry work at night should consider the various methods of lighting the quarry, and also just how to handle their labor proposition.

Quarries located near cities or towns that have electric lighting plants would find it advantageous to use electric lights, both in the crusher plant and quarry. The electric current could be purchased for this purpose. When this is not possible, but the quarry is equipped with a large steam plant, electric current can be generated and such lights used.

If power is not available in this way, then the system of lighting farm buildings by electric lights—using a gasoline engine for generating the current—could be used, one plant installed for the crusher plant, bins and shops, and a second plant, if necessary, for the quarry.

When steam shovels are used it is always possible to install a small generating plant on them, and not only have enough lights to illuminate the interior of the shovel, but also in front of the shovel for digging.

When it is not possible to obtain electric lights, acetylene lights can be used, and even when electric lights are employed it is always advisable to have several acetylene lights for emergencies, or places where it is not possible to have electric lights; and even to use where electric lights may cast a deep shadow.

With acetylene lights it is possible to light up the crusher plant, but it would also be wise to have some acetylene lanterns, so that they could be carried around the plant and used about and under the machinery. There are so many kinds and sizes of acetylene lamps and lanterns that one can be obtained for almost any purpose. Torches and flares are not necessary with so much better lights that cost only a few cents per hour

to operate. By putting on a pipe extension on the ordinary acetylene lamp the light can be raised five or six feet in the air, so that its range can be made much greater.

In order to carry on night work it is necessary to plan the work each day so that the night crew can go on without interference from any cause, for it takes little to upset a crew's work when darkness surrounds them.

One thing of great importance is to have all the necessary blasting done during the daylight hours, as it is almost impossible to do satisfactory blasting at night, even small black holes. These can be shot, but considerable risk is incurred of hurting people. The writer once made a blast in a quarry of three deep well holes at night, but he would not want to repeat such a thing, as the shot was not satisfactory in any respect.

If the blasting is properly looked after during the day, it will not be necessary to do any at night, for the day crew before quitting work can break up all boulders needing blasting, and those encountered during the night can be left for the day crew to break in the morning; just as in many quarries blasting is done at noontime and the quitting hour.

The day crew should always work with a view to favoring the night men in their work. This is difficult at times, especially if the men work at piece rates; but with care and judgment all such difficulties can be overcome.

If machinery is used in the quarry it is necessary to see that it is properly set during the day, so that uninterrupted work can be done at night. This is so with well drillers and also steam shovels and similar machinery.

What Service May We Expect?

HOW would you like to be a railroad official and have a railroad handed back to you?

Possibly there are more unpleasant positions in which to be placed, but just at the moment they do not occur to us.

With road beds showing the need of attention; with rolling stock far below standard both in quantity and condition; with operating expenses higher than they ever were in the history of railroading; with personnel badly disorganized—under these and other handicaps it is yet up to the roads to deliver service or lose public sympathy entirely.

Mr. A. G. Gutheim of the Car Service Section of the Railroad Administration commented on this in an address before the National Association of Sand and Gravel Producers, as reported in our last issue.

He said that starting in March 1st, the railroads will have to proceed very much by guess. He seemed to feel sure of one thing, however, and that is that they are going to make a determined effort to cut down expenses and get back to normal operating ratios, and at the same time give reasonable service. "They feel," he said, "that they are 'on their last lap of corporate ownership,' to quote the statement of one of the Interstate Commerce Commissioners, and that 'if they do not make good, they will not last.'"

Of course, no one will say that in one month the old brand of service will be restored. In calling attention to the disheartening condition of transportation, as pointed out by several of our correspondents, and as our readers in most localities are well aware, there can be no disposition to

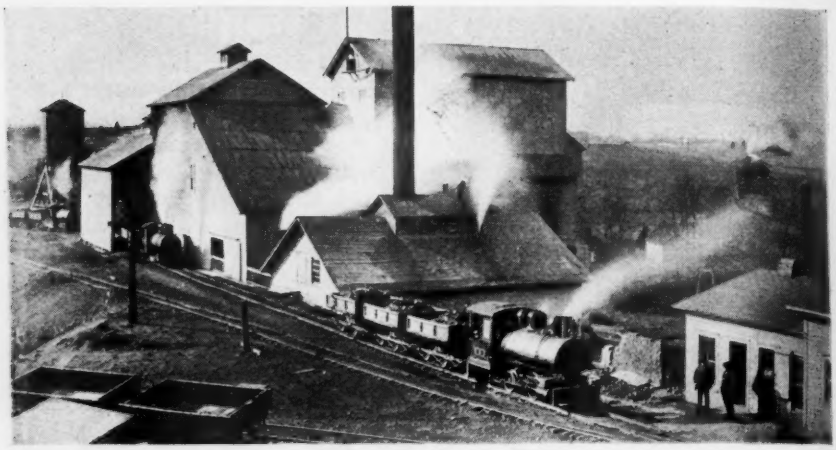
say that it is an evidence of failure to restore service.

But we wish that we might feel a somewhat greater confidence in a reasonably early restoration of such service. This would seem almost impossible, however, considering the rapid depletion of physical resources under government operation.

The attitude of the *Traffic World* is to be commended when it says:

"Of one thing we are very sure—every failure recorded under this new law will be seized upon by the advocates of government operation or ownership to make capital for their cause. It is up to those of us who would avoid ultimate government ownership to help make the new law a success. The permanence of the principle of private ownership and competitive business in the railroad field depends, not on showing how bad this law is and how much better some other law would be, but in showing that private operation can be made a success under this law, letting its amendment and improvement come as the natural result of continued experience by those who would preserve the principle and desire only perfect methods."

With a capital stock of $100,000 the Parkersburg Sand Company, Parkersburg, W. Va., has incorporated to operate a sand plant at Parkersburg. C. D. Forrer, John Marshall, M. E. Hiehle, F. C. O'Connor and J. W. Romine, all Parkersburg business men, are the incorporators.



Plant of Basic Products Company at Peebles, Ohio

Basic Products Plant at Peebles

Quarry and Crusher Plant Capable of Big Output

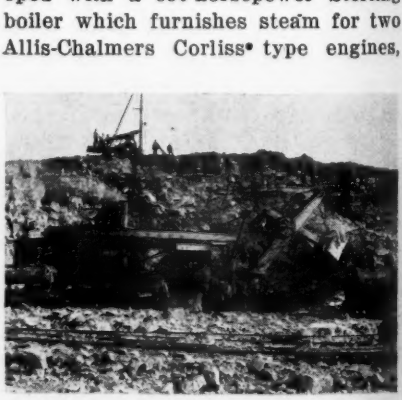
THE accompanying illustrations show several points of interest of the quarry and crushing plant of the Plum Run works of the Basic Products Company at Peebles, Ohio.

The quarry equipment consists of two Marion steam shovels, thirty-five Western side-dump 4-yard cars, four Porter locomotives, and a system of trackage of approximately 1½ miles.

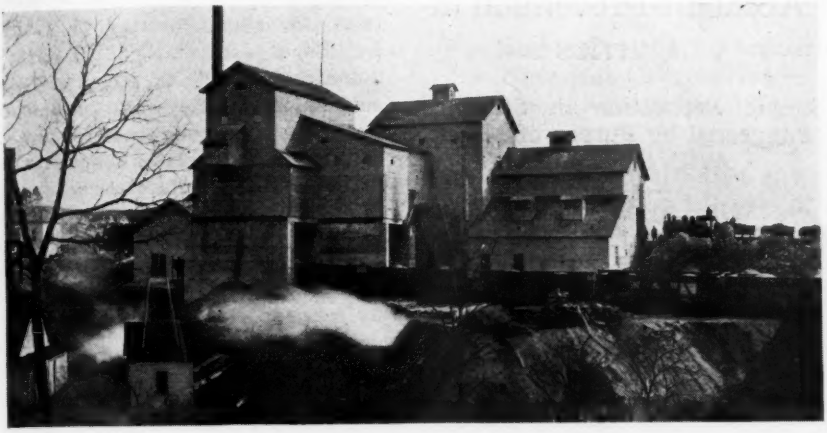
The quarry face, which runs about 45 to 60 feet, is first drilled with Loomis well drills, of which there are three. After the drilling, blasting is done in such a way as to break most of the stone down so that the 3½-yard dipper on the steam shovel will handle all pieces, although occasionally it is necessary to break some of the pieces from the original charge. The shovel picks this material up, loads the 4-yard cars, three cars of which constitute a trainload, due to heavy grades which they have at this time but which eventually will get down to a point where they can handle four or five cars to a train.

These cars carry the rock to the crushing plant, which includes six Allis-Chalmers Fairmount crushers of various sizes, ranging from a 36x60-inch down to a No. 4-K.

In addition to these, the plant has one 72-inch x 16 foot and two 48-inch x 16-foot Allis-Chalmers Gates type revolving screens and the necessary pan elevators and conveyors with transmission machinery for making a complete unit. The power is developed with a 350-horsepower Sterling boiler which furnishes steam for two Allis-Chalmers Corliss type engines,



Marion steam shovel in quarry



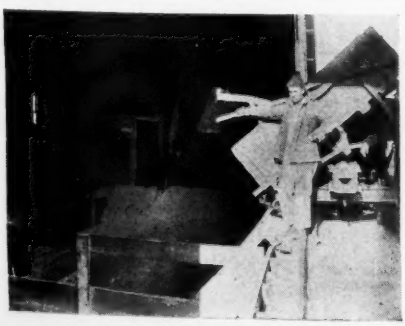
Another general view of the plant

one of which is rated at 125 horsepower and the other at 175 horsepower.

After the material as it comes from the quarry is broken down by the first crusher, which is set at a 6-inch opening, the material enters a 42-inch pan elevator discharging its contents into the 72-inch revolving screen. The over-size on this screen feeds the No. 8 crusher.

The size material screened out or under size drops to a belt conveyor and from there to a loading bin, this material being 1½ inches and finer. All above this size goes to the No. 8 crusher which is set at approximately 3 inches. After being crushed in the No. 8, it is elevated discharging in the two 48-inch screens, the oversize returning to the Nos. 4 and 5. The two No. 5's have special eccentric set the same as standard No. 4. The material is discharged from the No. 4 and 5 crushers into the elevator, and is elevated from the screens to the loading bins where it is ready to load in the cars.

The No. 8 plant, which was the first one installed, has been operating continuously since started. Nothing has ever happened that would cause a shut down. Any repairs which have been necessary, due to the ordinary wear, have always been done at night. The amount of repairs is exceedingly small for the amount of tonnage.



Emptying into the crusher

"Best Ever!"

SOME people have told us that our March issue was the best in our history. Thanks! It encourages us to learn that PIT AND QUARRY is appreciated. But it was an issue built up almost entirely by the men in the industry themselves. The more they cooperate, the more they get out of it. Other good issues can be produced in the same way.

The Manor Sand and Gravel Company, Philadelphia, Pa., has increased its capital stock from $50,000 to $200,000.

Accident Prevention in Qurries

Simple Precaution in Stripping Suggested by Bureau of Mines, Will Save Lives

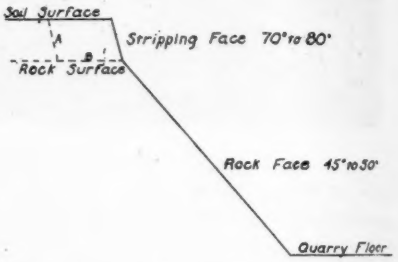
ON January 15, 1920, a man was killed by falling rock in a limestone quarry in Utah. The quarry was visited by a representative of the Industrial Commission of Utah, and the cause of the accident was carefully determined. The facts concerning this accident, and the Bureau of Mines' recommendations are given in some detail.

The quarry rock face is about 180 feet high and the ledge is covered with an overburden of 10 to 20 feet of a mixture of soil and boulders. The rock face is not vertical, but slants at an angle of about 45° to 50°, while the stripping face stands at an angle of 70° to 80°, and is flush with the rock face. The conditions are shown in the accompanying figure.

The man who was killed was employed in breaking rock at the foot of the quarry wall. The sun had been shinning on the stripping face, and probably thawed the ground, thus permitting a boulder weighing about 20 pounds to roll down the slanting face, striking, and almost instantly killing the workman who was working with his back toward the quarry wall.

The most obvious means of avoiding such accidents is to carry stripping operations ahead of quarry operations, and thus maintain a clean rock surface at the edge of the excavation. If the stripping face occupied a position as represented at A in the figure, any loose material that fell from it would remain on the level rock floor B, and would not fall into the quarry pit.

The attention of quarry operators is directed to the fact that the Bureau of Mines has issued a set of safety rules for stone quarries in Technical Paper III, entitled "Safety in Stone Quarrying." On page 28 of this publication, a rule which completely covers the dangerous condition present in this quarry reads as follows: "The stripped rock surface between the bank and the quarry pit should be wide enough so that there is no danger of soil falling or boulders rolling over



Stripping face should be as shown at A

the edge of the excavation. Serious accidents have resulted from slides of overburden into the quarry pit. The practice of making stripping walls almost continuous with quarry walls is very dangerous. If the stripped surface is narrow, or if it slants toward the excavation in such a manner that there is a possibility of material falling over the edge, a protecting fence should be maintained along the edge of the pit."

It is obvious that if quarry operators were familiar with the contents of this paper, and put into practice the rules given therein, the liability to such accidents would be reduced to a minimum. Safety pays, both in reputation and in ultimate economy, and quarrymen are urged to familiarize themselves with safety rules, and to immediately put them to practical use. Copies of Technical Paper III may be obtained by directing a request to the Bureau of Mines, Washington, D. C. U. S. Bureau of Mines, Reports of Investigations.

Lady on Lime Staff

Miss Edith J. Munsell Will Do Editorial Work in Agricultural Bureau

AS A PART of the expansion of the staff of the National Lime Association, authorized by the recent meeting of the Board of Directors, Miss Edith J. Munsell has become editorial clerk in the Agricultural Department.

Miss Munsell is a college woman who was for several years assistant editor of the publications of the New York State College of Agriculture. She acted in a similar capacity in the United States Department of Agriculture for a short time and for the last four years has been editor in the Division of Foods and Markets under the New York State Council of Farms and Markets. In that capacity she has also had immediate charge of the editing of the monthly periodical issued by that office.

She will assist in the collection and filing of the large amount of material being issued currently on the relation of lime to agriculture, in the preparation of special articles for the press, and in the preparation and issue of the Agricultural Lime News Bulletin soon to be started by the National Lime Association. This news bulletin will be one of the most important publications in the agricultural field as it will be sent to all men in agricultural institutions in Soil and Crop work, to the County Agricultural Demonstration Agents, and to the Agricultural press, and will keep them posted on the use of lime in agriculture.

The Wilson Sand & Supply Co., Huntington, W. Va., is planning for the rebuilding of its plant recently destroyed by fire with loss of about $10,000.

New Office Opened

Portland Cement Association Now Has Oregon Headquarters

THE Portland Cement Association announces the opening of a new office in Portland, Oregon, at 146 Fifth Street, with Hans Mumm, Jr., as district engineer in charge.

Since 1903 Mr. Mumm has been engaged in various lines of engineering work in Washington, having been county engineer of Snohomish County from 1912 to 1915, and the year following, city engineer of Everett, Washington.

Mr. Mumm joined the staff of the Portland Cement Association in 1916, since which time he has been identified with association work in Washington.

Getting Data on Lime

Census Bureau Now Sending Out Questionnaire to Producers

THE United States Census Bureau is distributing very comprehensive questionnaire or data sheets calling for information on the forms, amount, uses and distribution of lime products and type of equipment used.

There will be two forms; one for burnt lime and the other for limestone. These schedules have been prepared by the United States Geological Survey and will also be used in compilation of statistics which are annually collected by that office.

Much of this data is of the same character as that called for by the reports on tonnage which the members of the National Lime Association have been reporting to the central office. The records kept for this latter purpose will be very serviceable to companies in making up the Census and Geological Survey reports.

Stock Piles and How to Manage Them

By DANIEL J. HAUER

STOCK piles in crushed stone quarries and gravel pits are used under two conditions that operators must face.

One is when a quarry is operated during the winter and the demand for stone is slight, causing the product to be piled up in the quarry in a reserve pile, after the bins are filled.

The second occasion is when orders are in hand, but cars cannot be obtained regularly for shipment, thus necessitating storage piles, so that when cars are obtained in any number they can be loaded promptly.

Stock piles under these two conditions are necessary, and a discussion of the subject at this time is opportune—just at the close of the winter season and when operators in both pits and quarries are about to start in a season when a car shortage seems inevitable, or at least the supply of cars will be irregular, none for several days, then a large number in a single day.

A decade ago there were few methods of handling stone and gravel in storage piles except by hand, but fortunately there are a number of machines that can be employed today, so that it is an easy matter to handle the stone at a small cost. When only wagons or trucks are used for delivering stone, the matter is somewhat simplified, as the stone is loaded directly into the vehicles, but with railroad shipment wagons or trucks may first have to be loaded and the cars loaded from these.

Thus the first consideration with railroad shipment is the location of the storage piles. Whenever possible, the pile or piles should be located where direct rehandling into the cars is possible. This alone will mean to save at least half the cost of rehandling. The distance the stone can be piled up from the cars will depend upon the kind of machinery used for picking up the stone. Then, too, if the piles are large, by some methods all of it cannot be rehandled directly to the cars.

If the majority of the stone cannot be handled directly from the piles to the cars, then it matters little if the storage is a hundred feet from the railroad or several hundred feet, as the cost of hauling for a short distance is not materially increased by a few hundred feet.

One factor in stock piles is the method of making them; in fact, today with machinery for picking up the stone from the pile, the largest cost may be in placing the material in storage. Wagons or trucks may have to be employed for this purpose, and the great trouble is to make the pile of such height as not to cover too large an area. In picking up the stone, no matter what kind of a machine is used, the greater the mass as to height and limited area, the greater ease and less cost in picking it up. This means that the stone should always be put in fairly large, high piles. If wagons or trucks are used, they must ascend a steep grade before unloading, and then return to the ground. This means for a wagon or cart that there must be room on the pile to turn around. A truck can back up and run down the same road empty, or operate vice versa.

It is possible to go over a large area and dump a load or two on top of the other with trucks or wagons, but this means a large area covered and expensive picking up.

If the screens in the crusher house are well elevated it is possible, if space is available for piling near the crusher plant, to make large piles by means of chutes, putting each size of stone in separate piles.

Then again, if a sloping hillside is available near a loading track, open sloping bins or platforms can be built both quickly and cheaply, and chutes used to load cars from these platforms. Wagons or trucks are used to haul the stone to the top of the hill, when it is dumped and handled to the cars by gravity. The writer has used this method when the land lay right for it, using a few men with rakes or forks to keep the stone moving when loading cars.

In other words, when topographical conditions admit of it, advantage should be taken to use gravity for handling the stone.

When the stone is in stock piles it can be picked up by several means. One is by derricks or cableways with grab buckets. The cableway and derrick, if their reach is great enough, can load the cars directly, saving any hauling. Stock piles can also be built with these machines. A wagon or truck can dump onto the ground or into a pit or boot within reach of the machine, which can pick it up with either a clam-shell or grab bucket and dump it on top of the pile, picking it up from here later and loading it in the car. Of course, trucks and wagons can be loaded in the same manner. This same kind of grab bucket can be used with locomotive cranes or similar devices.

On derricks it is also possible to use a Bishop bucket, which is a steam shovel dipper operating on a derrick boom. Likewise a derrick can pick up stone at one side of a cableway, load a skip under the cable and by means of this load cars.

There are on the market a number of wagon loaders which can be used, and are used extensively for rehandling stone from storage piles. These machines either have a bucket elevator or a belt conveyor for raising the stone. Some of them are equipped with paddles or digging devices for throwing the stone from the sides to where it will be picked up by the buckets or belts. These machines eat their way into a large pile, but as their reach is limited, they can seldom be used to load cars direct. For truck and wagon loading they are difficult to beat.

Steam shovels and similar machines can also be used to load cars directly or load wagons or trucks. If a car track runs parallel with the stock pile, all the stone could be loaded directly by these machines. But steam shovels, like the wagon loaders, are not adapted to building up the stock piles.

When such machines are used for rehandling and the screens are high above the quarry floor where the storage piles are to be located, the stone can be placed in the piles by means of dump cars. A light trestle, either temporary or permanent, is built over the site of the piles, and cars loaded at the screens are run out upon the trestle and dumped, each size in a separate pile. This method keeps the piles in good shape and means cheap rehandling, as the stone can be picked up more easily, since it is not compacted by traveling over it. Such a trestle can be used from year to year. The cars, when not employed in such work, can be used in the quarry.

Drag power scrapers on a slack line cableway can also be used in rehandling material from stock piles. Teeth must be provided on the scraper, and in this case the stone or gravel should not be piled too high. There must be a dumping platform built over the car,

as is done when handling sand with such scrapers.

More elaborate systems of storing stone and rehandling it can be devised with conveyors. If the business warrants it, permanent storage piles can be arranged on either or both sides of the crusher house. From the screens, running each way, can be built belt conveyors, kept well up in the air on posts. Under these conveyors partitions can be placed to keep the various sizes separate. This piles the stone. Under the piles in a concrete or wooden trough another belt conveyor is installed. Through gates the stone is allowed to go onto the buried conveyor, which carries it to a boot, where it is picked up by a bucket conveyor or elevator and dumped into the regular bins and loaded through them onto the cars. By this method the process is continual and the cost of both storing and rehandling is small, but the initial cost of installation is large, this being the only objection to it.

A rehandling system of this kind will pay if winter work is done and if the car supply is irregular during the summer. It means continuous operation of the quarry and quick shipment of all cars when received. With such arrangements the only limit to the daily shipment would be the capacity of the conveying handling machinery. The regular bins need only be of fair size, as the ground reserve pile can be made larger at small cost, the ordinary reserve being carried there.

The Midland Gravel Company, Midland, Mich., has organized with a capital of $100,000 for the purpose of furnishing gravel of extra quality for concrete uses. This company has purchased a 60-acre gravel pit at Millbrook, Mecosta County, Mich., where the gravel is found in a vein 60 feet deep, the purchase price being about $15,000.

Can't Make Cement For $2 at Monolith

So Apparently Municipal Cement Plant Is No Money-Maker

EVERY little while there is some kind of a hearing in Los Angeles regarding the old cement plant at Monolith, relic of the big aqueduct construction.

At a recent session of this kind, the question was raised as to the cost of making cement at this plant.

The board referred the query to Chief Engineer Mulholland, who made verbal answer.

"It would cost a good deal more than $2 a barrel to make cement at the Monolith plant at the present time," said Mr. Mulholland. "I'd feel as though I was accomplishing a great deal if I could make cement now for $2 per barrel. The price of labor, of fuel oil and of all factors that go into the making of cement has been very greatly increased since the time when the city operated the plant."

Change in Universal Staff

G. E. Warren has resigned his position as assistant manager of the Service Bureau of the Universal Portland Cement Co., Chicago, taking effect April 1, to continue his duties as manager of the American Concrete Pipe Association. Mr. Warren has been with the Universal Company for five years, during the last year of which he has also acted as secretary-treasurer of the American Concrete Pipe Association.

This association has recently been reorganized and will open an office in Chicago with sufficient help to carry on its broadened activities.

J. W. Lowell, eastern manager of the Service Bureau of the Universal Portland Cement Co., beginning April 1, will assume the duties of assistant manager of the same department at its headquarters in Chicago.

H. C. L.

BY E. G. BROWN

Manager Milwaukee Office, Janesville Sand and Gravel Company

I talked to the farmer; he passed the buck
By saying that he was out of luck.
"Look what I pay for my tools and twine
And the clothes I buy for me and mine.
Why shouldn't I get enough for my milk
To buy my wife a dress of silk
And also an auto to be in style,
For it takes too long to walk a mile.
It's the pesky man that keeps the store
That takes all I make and then some more,
And he's to blame for this H. C. L.
And that's the truth I'm here to tell."

I asked of the merchant the why and where
Of the reason that prices were up in the air.
"It's as plain as the nose," he said, "on your face,
That the manufacturers set the pace;
They raise the price on what is here
Till there won't be a profit at all this year.
"You'll have to go to them," he said,
"And I wish to goodness they all were dead."

I asked the man who made the tools
If he thought the merchants all were fools,
And what he raised the prices for
When as yet we haven't got over the war?
"It's no fault of mine," he said to me,
"Just put the blame where it ought to be.
It's the men who have money and want to get more,
And they are the ones who make me sore;
They say that my dollars, without defense,
Are only worth but fifty cents.
And the wages I pay, why man, it's a fright,
They've kept going up till they're out of sight.
Just go to the banker and there you'll find
The reason for what you have in mind."

Here at last I had found a man that knew;
At least what he said I thought was true,
So I asked of the banker what he did with his money
And he looked at me smiling and said it was funny.
"It's none of it mine; you surely should know
The others have left it with me to grow.
The farmer, the merchant, the man who makes tools,
Have left it with us because we're such fools
We do all their work and don't charge a cent
Except for the money perhaps that is lent.
But I think if you go to the man who lays brick
You'll find just the man we all ought to kick."

So I went to the mason and asked what he thought
Of the evil he'd done and the trouble he'd brought.
"Why, man, is it possible you don't see
There's nothing at all that's left for me;
A dollar 'n' quarter an hour," he said,
"An' at that I have to beg my bread;
An' look what the farmers charge for meat;
I can't buy enough for the kids to eat."

So it goes in a circle, this H. C. of L.
As we look for the chance to give it h——
But the trouble is this—if you think just a minute—
We're all of us trying to get all that's in it.

Motor Truck Compared With Horse Equipment

By C. H. WOODRUFF
General Sales Manager the O. Armleder Company, Cincinnati, Ohio

SEVERAL things condition the kind of transportation system needed to haul sand, stone, gravel and other building materials.

1. These products are of great weight and are hauled in large quantities.

2. The haulage covers all sorts of conditions, from getting out of pits to traveling on smooth pavements, and getting into and out of difficult places at the job.

3. The means of transportation for this business must necessarily possess tremendous strength, endurance, facility, flexibility and reliability. If it falls short in these respects, it means a loss of money to the contractor or operator.

It is these conditions which have caused contractors and building material men to turn to the motor truck as the most efficient, economical and satisfactory means of transportation for this kind of material under the conditions which prevail.

Horse equipment is inadequate. The natural physical limitations of the horse make it slow and expensive. For instance, the average radius for traveling of a team of horses is sixteen to eighteen miles. The usual rate of travel is three miles an hour, and the average hauling capacity of horse equipment is three tons, but with a motor truck the radius of travel is increased to 50 or 100 miles. The average speed is 10 to 12 miles an hour, its hauling capacity ranging anywhere from 3 to 10 tons. The number of trips is limited only by the physical capacity and comfort of those who operate it.

A motor truck will travel three to five times the distance of horse equipment in the same length of time, at four times the speed and with two or three times the load. Naturally the result is reduced cost of operation.

With mechanical equipment it requires about 30 seconds to load a motor truck. Unloading a truck, which is accomplished by means of a hydraulic hoist operated by the motor, usually takes 1 minute or less. The entire performance of maneuvering the truck into position, hauling 1 mile, dumping and returning, requires on an average about 13 minutes. Of course traffic congestion and other conditions outside the control of the motor truck may change this result materially. With a team and wagon this time is much greater. The slow speed of the team, the difficulty of backing into position and operating the hand equipment, all reduce the efficiency and economy of horse-drawn vehicles.

In cities the usual distance of hauling is 1 mile. This, as has been shown above, requires about 13 minutes for the round trip. In a work day of 10 hours this would make 44 trips with a conveyance of 176 cubic yards of loose materials.

The average rate prior to the war in certain western cities was 40 cents a cubic yard. This would make a daily earning of $70.41, or 11 cents a minute. The average earning capacity of a team and wagon under the abnormal war conditions in 1918 was $10.00 a day of 10 hours, or at a rate of 1⅔ cents a minute. From this it will be seen that the income of the

motor truck is nearly six times greater than that of the team. In 1918 the average rental of a motor truck was $3.60 an hour, or 6 cents a minute. Thus, the income for a day of 10 hours—the average working day is 9 hours—is $36.00.

With the income of $36.00 a day for the truck and a daily expense of $22.00 the profit amounts to $14.00. The income from the rental of a team is about $9.00 and the expense of operating the team will largely eat up the profits.

As compared with horse equipment the earnings of the motor truck are from three to five times as great.

The above comparison does not take into consideration the use of trailers. Under suitable conditions one or more trailers can be used with very satisfactory results and at a trifling increase in cost as compared with the results achieved.

The ability to deliver material in any quantity, at any time and under any conditions is almost imperative in the building industry. With a motor truck this is possible in a way wholly unattainable with horse equipment. A motor truck will often displace three teams and wagons and not only give better service, but reduce the cost of operation. Three teams with their equipment will ordinarily cost $10,000. The cost of a motor truck in the stone and sand industry will average about $4,500, hardly half the cost of horse equipment necessary to do the same amount of work.

In the construction of the Big Meadow Dam in southern California, four motor trucks of 4-tons capacity were used. The nearest railroad station was 26 miles distant. The roads are steep and narrow mountain trails of decomposed lava. For more than a month these four 4-ton motor trucks carried an average of 40 tons of cement every 24 hours. The fifth machine held in readiness for an emergency was called into service but twice on account of repairs made to the others.

A New England cement dealer found that a single 3-ton motor truck replaced four two-horse teams, the machine traveling on an average of 65 miles a day. The annual cost of horse equipment displaced was $8,330, of which $1,800 was for cost of labor. The total cost of the machine was $2,370.02 a year. This figure included fuel oil, $650; repairs and overhauling, $370; labor, interest on investment at 6 per cent, and depreciation at 20 per cent, $1,350.02; insurance, $150. The annual economy, therefore, was $5,890.98 in favor of the motor truck.

In the haulage of crushed stone a large motor truck traveled 68.4 miles, delivered 32.8 cubic yards of material in a day, at a total cost of $14.03, or 43 cents a cubic yard. The best day's record working 10 hours on a round trip of 3.86 miles was 88.72 cubic yards, carried in fifteen loads with a fuel consumption of 17 gallons of gasoline. The cost of doing the same work with horses would have been $35.94, while the cost of operating the machine was less than $14.00.

In another case a motor truck traveled 55 miles in one day and delivered 50.32 cubic yards of stone, running 5½ miles on each gallon of gasoline.

In hauling material for concrete work a 2-ton motor truck drawing a 5-ton trailer showed an economy of nearly $2,000 between May 18th and November 24th. During that period the outfit hauled 7,500 tons of crushed stone and traveled a total distance of 6,000 miles. The total cost of the work was $868.19, including $274.99 for fuel and oil, $244.17 for repairs and new rear tires and $349.03 for labor and insurance. The average load on

each trip was 7 tons and the average distance covered each day was 50 miles.

Another concern operating a 5-ton motor truck made ten or eleven round trips of 8.1 miles each, hauling sand and gravel from railroad cars to a building site 4 miles away, carrying 4.5 cubic yards or about 6 tons at a load. The machine hauled between 60 and 70 tons daily, or a total of about 45 to 50 cubic yards. The loading was done in average time of from 2 to 3 minutes per trip by means of portable mechanical loaders. Two-horse teams doing the same work carry from 1.5 to 2 cubic yards at a load and make four trips in a 10-hour day, at a daily cost of $6.00 each. The machine, which cost in the neighborhood of $24.50 a day, did the work which would have required six or seven teams, costing from $36.00 to $42.00.

It is results such as these that are causing building material men, contractors and owners of pits and quarries to discard their horse equipment in favor of motor trucks. The motor truck is tireless and not subject to exhaustion from heat or cold. It also causes less exhaustion to man power than horse equipment. An investigation of the above figures will inevitably lead to the using of motor trucks in the hauling of sand, gravel, stone and other building material.

The Gandy Belting Company announces the opening of a branch in Chicago, located at 549 W. Washington boulevard, corner of South Clinton. Mr. Fielder I. Schillinberg, who has been in charge of the New York branch, will be the manager.

The Bloedel Fuel Company has opened a new gravel and sand pit in the town of Taycheedah, near Fond du Lac, Wis., on a 5-acre tract, and deliveries will begin as soon as practicable. The company is adding sand and gravel to its output.

Data on Truck Operation

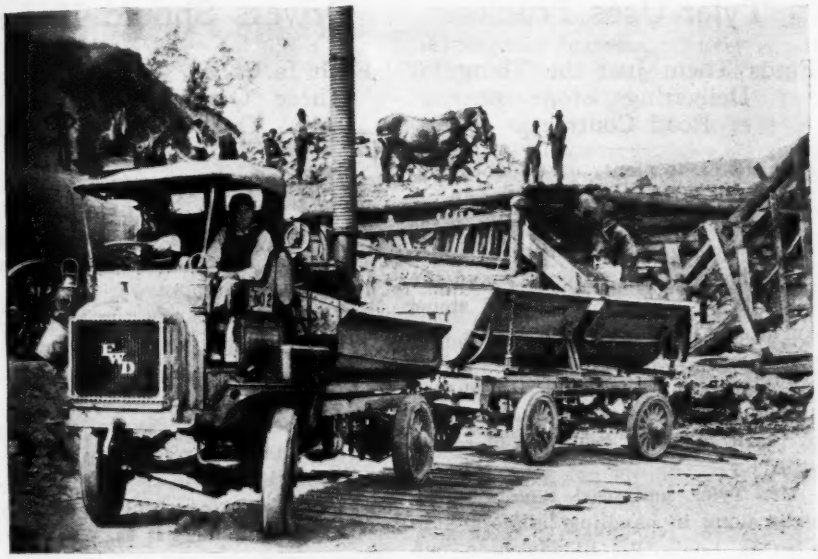
Some Actual Records on Hauling Road Materials in Michigan

IN THE pit and in the quarry, as in numerous other lines of industry, the motor truck is supplanting the horse. In so many ways have advantages come to the users that the question of expediency in making the change from horse power to truck in the transportation of material most speedily solves itself.

There are, however, several important considerations that enter into the question of truck usage in pits and quarries. Probably in no other industry is the strain on a truck so great as it is in this work. The climb from the pit on more or less steep grades, loaded to capacity and hauling a trailer, is a feat that taxes the power and strength of a truck almost to its utmost and unless it is properly built to withstand this strain the double loss of time and money is certain to result.

The strength and durability of the truck after months of this strenuous hauling each day, is, after all, the vital factor in its cost of operation. A truck that cannot stand the "gaff" is certain to lose money for its owner in the way of repair bills for its upkeep. Proper loading and careful driving, with a plentiful application of motor oil, will increase the life of every truck.

The following figures on the cost of operation of an FWD truck equipped with 2½-yard Woods vertical hydraulic hoist, steel dump body and a 5-ton trailer equipped with 4-yard dump body, were compiled by the Iron County Road Commission of Iron County, Michigan, and tell the story of the cost of operation of a three-ton truck in its daily work, which includes all phases of the business:



Hauling road materials in Iron County, Michigan

OPERATING DATA

	Per Year	Per Day
Fixed Charges:		
Depreciation—10% ($7,900—$488.80 tires), $7,411.20	$ 741.12	$ 2.47
Interest 5% of half of $7,900.00—(Investment)	197.50	.66
Insurance (Permit to use trailer)	132.54	.44
Garage (no rent)	.....	.....
License (exempt)	.....	.....
Taxes (exempt)	.....	.....
	$1,071.16	$ 3.57
Estimated Maintenance:		
Repair parts @ .007 per mi.	114.00	.38
Complete overhaul once every 20,000 mi. @ .0078 per mi.	126.00	.42
50% additional for trailer	120.00	.40
	$ 360.00	$ 1.20
Material for Operation:		
Gasoline 2.82 mi. per gal. for 59.88 mi. per days @ .239 gal.	$1,523.10	$ 5.08
Grease and trans. oil (none listed).		
Motor oil @ .49 gal., .0049 per mi.	88.44	.29
Eight solid tires @ $61.10 each (estimated 15,000 mi.)	528.00	1.76
	$2,139.54	$ 7.13
Labor:		
Driver's wages, $0.50 per hour	$1,350.00	$ 4.50
Helpers' wages @ $4.00 per day	1,200.00	4.00
	$2,550.00	$ 8.50
Total	$6,120.70	$20.40

Actual Work Accomplished per 9-hour Day:

.39 cubic yards hauled (based on 2,700 pounds to 1 cubic yard).
59.88 miles traveled.
51.82 tons hauled.
191.63 ton miles.

The Actual Daily Cost is $20.40:

.53 per cubic yard.
.34 per mile.
.393 per ton. .106 per ton mile.

Working a nine-hour day, 300 days a year, hauling an average of 7.4 miles over ordinary roads, with not over 6% grade; with three tons on truck and 3.4 tons on trailer, total net load 6.4 tons or 4.74 cubic yards, averaging one trip in 1.08 hours, 8.08 trips and 59.88 minutes per day, based on the approximate investment of $7,900.00 for truck and trailer.

Tyler Uses Trucks

Finds Them Just the Thing for Delivering Stone on Road Contracts.

THERE is plenty of evidence that the motor truck is to play an important part at the quarry in the future, especially as a means of transportation between the quarry and the roads being built from crushed stone. An interesting illustration of the possibilities here, and of the changes taking place in connection with quarry and stone crusher work, is furnished by the R. B. Tyler Stone Co., of Louisville, Ky.

Mr. Tyler has used motor trucks right along in handling builders' supplies in Louisville, having been one of the first to introduce trucks for this purpose. Recently as a result of some road contracts he has opened up a quarry at Hodgensville, Ky. It is here that the trucks are playing an important part in making deliveries to the roadways under construction.

He has in operation a Knox tractor unit with a 6-ton dump trailer, a White 4½-ton dump truck, and an Indiana 3½-ton dump truck. Haul distances average about 3 miles, and in this work he figures that the trucks are giving a much better account of themselves than could horses or mules.

The work has not continued long enough yet for him to have available specific data as to ton-mile cost, but from a practical standpoint he figures that it is easily apparent the trucks are the thing. Mules and horses might do on short hauls but on hauls averaging up to 3 miles it would be an impractical proposition and the cost would run too high. It is here the truck comes in and fills the need in a manner which bespeaks the dawning of a new day in truck service at the quarries.

Drivers Should Know

Each Is Called Upon to Answer These Questions Daily by One Employer

IN cutting down operating expenses, one concern has the following questions printed on the daily report of every motor truck driver, and he is expected to answer them:

(1) Are brakes working properly?
(2) Are lights working properly?
(3) Does truck squeak or rattle?
(4) Does truck lack power?
(5) Does clutch engage smoothly?
(6) Is there any leak?
(7) Is the engine clean?
(8) Are bearings properly adjusted?

Each driver finds it easy to answer these questions, and the answers are a substitute for daily inspection. Of course, he also adds to his answers to these questions anything he wishes concerning the condition of his truck.

The Wisconsin Granite Company is installing a very large new rock crusher in Sioux Falls, S. D., the foundations already being in process of construction. J. J. Sloan, of Chicago, secretary of the company, was in Sioux Falls several days attending to the plans for the enlargement of the plant there, which is expected to treble the capacity of the company. The new rock crusher will be a 36-inch jaw crusher. Steam shovels will be installed for loading. The bins will also be arranged so that the rock can be loaded onto trucks, wagons and cars at the same time. Unless the materials are delayed in shipment, the plant is expected to be ready for operation May 1.

The Coast Rock & Gravel Company has incorporated, with a capital of $250,000. The main office will be at 500 Call Building, San Francisco, Cal. The directors are: Emery Oliver, Frederick R. Woods, Jr., and Arthur R. Wilson. The company has leased the rock crushing plants of the Natomas Company of California.

Spring Has Come In Dallas

And With It There Is a Marked Inability to Make All Deliveries of Gravel and Stone

THE advent of warm weather in the vicinity of Dallas, Tex., making resumption of building operations on a large scale possible, has greatly increased activity in the gravel, sand and crushed stone industry. Good weather has also dried out roads and highways, making hauling possible, and all sand and gravel pits in this section are working at full capacity, and rock crushers are unable to anyway near fill the demand for crushed stone. Large paving contracts in Dallas and other large cities have been held up for weeks on account of inability to get crushed rock. The increased demand has caused several new rock crushers to be put in, and as soon as these begin operations it is expected that the demand will at least be partially met. The new crushers are booking orders far ahead, however, and the increasing demand for crushed rock with the rapid development of highway building may more than consume the increased production of crushed rock.

The J. Fred Smith Gravel Company, which operates extensive pits north of Dallas where loading direct from pits to railroad cars is done with steam shovels and drag lines; the West Dallas Gravel Company, which operates a fleet of motor trucks and delivers gravel on the job in Dallas; Vilbig Bros., large contractors, who operate their own motor trucks for hauling gravel; the Trinity Gravel Company, and other concerns report heavy demand for gravel with orders booked ahead. They are unable to make deliveries of all gravel ordered.

The increased demand has resulted in advances in price. Gravel is now being delivered to the City of Dallas, according to City Engineer Fairtrace's figures, at $2.50 to $3.00 per cubic yard. County Engineer W. J. Powell reports that the county is using a fleet of Government motor trucks and is doing its own gravel hauling, which is purchased at the pits for an average of $1.00 per cubic yard. Gravel in small quantities is being delivered by the gravel companies within the city limits at $3.50 and $4.00 per cubic yard, but it is extremely difficult to get gravel in small quantities as all firms are busy on large orders and do not care to deal with the small orders.

Several large gravel orders have been placed recently, but prices in most cases have been withheld by contracting parties. The County Commissioners of Johnson County have awarded contract to J. L. Rogers, who operates extensive gravel pits in Hill County, for 15,000 carloads of gravel to be used in improving the Johnson county system of highways, for which $2,000,000 in bonds was recently voted.

Orange County has also placed an order for about 5,000 carloads of gravel from pits just across the state line in Louisiana, the gravel to be delivered in Orange. One thousand cars of this gravel were delivered last week, and is now being hauled by road contractors from Orange to the roads where they are at work. This gravel was purchased by the county at $2.50 per cubic yard delivered in Orange, according to unofficial information.

The City of Dallas has just placed large orders with the Texas Stone Company of Chico, and has priority order for delivery. The Texas Stone Company has been operating several old rock crushers in the vicinity of Chico, but has found these inadequate

and is now erecting an immense plant at a cost of $450,000. This plant will be completed and put in operation in less than 60 days and it is believed that all orders will then be filled.

The City of Dallas has contracted for 350 carloads of crushed rock, which will include 50 carloads of "chats" at $1.25 per cubic yard, 50 carloads of top stone at 50 cents per cubic yard and 250 carloads of crusher-run rock at $1.00 per cubic yard. Having priority of order, some of this rock is being delivered from the Texas Stone Company's old crushers, but the majority of it will come from the new plant when it is completed. The first shipments of this rock will be used in the resurfacing of Jefferson Avenue from Lancaster to Polk, a $90,000 contract which has been held up for about six months on account of inability to get crushed rock.

The Bull Creek Crushed Stone Company of Bull Creek also has a large order for crushed stone from the City of Dallas. John L. King, manager of this company, has notified the city, however, that his company can not deliver the order to city, because it has entered contract with the Texas & Pacific Railway Company for the entire output of its plant at a higher figure than the city had agreed to pay. Litigation over this contract may be begun by the city.

Cement deliveries are also delaying building operations and street and road improvement. Contractors and others have enlisted the aid of the Texas Chamber of Commerce in an effort to expedite deliveries by railroads with the hope that conditions will be improved. A carload of cement recently was delivered in Fort Worth after long delay, and investigation showed that this car had been shipped from Dallas on Dec. 27 and delivered in Forth Worth on Feb. 18, or 52 days thereafter.

"Keep The Cement Sacks At Work"

Campaign to Cut Down Sack Cost Started by Manufacturers

CEMENT sacks run into a lot of money, especially when they are not well taken care of, or returned promptly. In an effort to lower the sack cost, the Portland Cement Association has started a campaign, the first gun of which is a circular letter headed "Keep the Cement Sacks at Work." The circular says:

One empty sack at the cement mill is worth any number of them lying idle in dealers' or users' hands all over the country in so far as shipment of cement is concerned. Like many other kinds of cotton goods, cement sacks are scarce. If every idle cement sack in the country were returned to the plant which sent it out, there would be considerable relief of the present shortage both of cement and sacks.

Besides, cement sacks cost you money—money which is not working for you as long as you keep the sacks in your possession and thus make it impossible for the manufacturer to buy them back.

This condition is simply another one of those seemingly trifling items of neglect, that in its own way is contributing to keeping the wheels of industry from moving as regularly and as smoothly as we all would like.

If a cement plant ships 1,000,000 barrels of cement a year in sacks, 4,000,000 sacks are necessary to take care of this shipment. Under actual conditions when shipments are made every day, the cement plant at the end of a year would find itself short of a very large number of sacks because dealers or cement users have not returned all they received. The following year it would, therefore, be necessary to supplement the stock of sacks by purchasing new ones. Sooner or later some sacks are certain to be lost through neglect or because put to improper use and thereby permanently kept from being again used as cement containers. No one knows exactly what becomes of them, but if lost

while in your possession, it means money lost to you.

Many building and highway contractors have shown commendable enterprise in purchasing and storing during the past winter large quantities of cement in anticipation of immediate need when the construction season opens. Naturally this has temporarily prevented the circulation of many cloth sacks. Nevertheless there are enough empty sacks in users' and dealers' possession throughout the country, which, if returned to the cement mills, would make the number held out of circulation through storage of cement relatively insignificant.

Remember, cloth cement sacks represent on outlay of money by you until you have returned them for credit, and if they are not returned promptly, that the cement manufacturer must provide for new containers to take care of his business with you. This represents an unnecessary waste, because far more containers must be manufactured and used than would actually be necessary if every cement sack was kept at work.

Take care of cement sacks.

Keep them at work.

Return them promptly so the cement manufacturer can ship the cement you want.

Starting Earlier On The Ohio River

Producers Compelled to Start Digging at Louisville to Meet Demands

ONE of the most cheering things for the crushed stone industry in Kentucky is in the enactment of legislation which opens the way to both Federal aid and to quite a pretentious line of road building in the state during the year. Kentucky has already qualified for Federal aid money to the extent of $1,562,266, and contracts are being let and work has started up at a rate that is very encouraging for the stone quarrying and crushing industries in the state.

R. B. Tyler is very busy at his new plant at Hodgensville, Ky., where he has road contracts and has tractors and trucks helping carry on the work. Also he is now starting up his plant at Tucker Station near Louisville and he feels encouraged over the resumption of work on the Dixie Highway through Camp Knox for which he had contracts.

The local sand and gravel people have had such an unusually good volume of winter business that they have had to start their diggers out along the Ohio River somewhat earlier this year than usual.

The Ohio River Sand Co., which had stocked a good supply of sand and gravel last fall, report that their stocks became so nearly exhausted that they had to start their digger out nearly a month earlier than usual this year and at this writing they are having fairly busy times all around.

A matter of some concern to sand people as well as others using trucks is the new state law just enacted which doubles the state license tax on motor vehicles. Under the schedule a five-ton truck, according to the best estimate obtainable will have to pay $150 state license and $27.50 city license in addition, of course, to the regular property tax. This is just double the previous state license required and it adds that much to the cost of delivery service. Some have figured that it is even worse than this but inquiry by your correspondent for specific figures brings forth the data given here as the situation is now understood by the local sand and gravel people.

The W. H. Cloud Moulding Sand Co., Louisville, has been incorporated with a capital stock of $5,000, the incorporators are, W. H. Cloud, L. M. Cloud and W. R. Neill.

A new corporation is Burress Gravel Company, Shoals, Ind., whose directors are John E. Burress, Bert O. Burress, Frank E. Gilkison and Alva O. Gilkison. Their invested capital is $25,000.

Wages Being Paid in Wisconsin

Mineral Aggregate Association Makes Compilation of Rates

THE Wisconsin Mineral Aggregate Association recently sent out a questionnaire to its members regarding the rates of wages paid for the various lines of work. The compilation of the replies is shown in the accompanying table, each column of figures representing the report of one concern.

In addition to these wages, a majority of producers have in operation some kind of bonus or profit-sharing plan.

The Real President

OUR attention has been called, by Geo. V. Miller of Indianapolis, to the fact that we gave him credit in the March issue for holding the office of president of the Indiana Sand and Gravel Producers Association. This is an honor which he could carry very gracefully; but as a matter of fact, everyone knows that the Indiana president is H. C. Hoffstetter, also of Indianapolis, who disclaims any hard feelings whatever on account of this error.

WAGE CLASSIFICATION REPORT OF WISCONSIN

Rate Per Hour (Cents)

Millwrights	65	..	..	..	..	..	..	..	..	..	..	..
Crusher Feeders	50	..	52	..	..	..	..	50	..	..	..	..
Blacksmith	50	..	..	..	..	..	..	..	..	..	..	..
Blacksmith Helper	45	..	..	..	..	..	..	..	..	..	..	..
Elec. Dinkey Engineer	..	..	49½	..	..	..	..	..	..	..	..	..
Elec. Dinkey Brakeman	..	..	48½	..	..	..	..	..	..	..	..	..
Drag Line Engineer	..	75	..	..	..	..	..	..	..	..	60	..
Drag Line Fireman	..	60	..	..	..	..	..	..	..	..	50	..
Shovel Engineer	..	..	..	..	..	..	..	..	60	..	..	65
Locomotive Engineer	..	..	..	..	..	..	..	..	60	..	60	..
Locomotive Crane Runner	..	..	..	..	..	..	..	60	..	..	..	..
Stationary Engineer	55	..	..	..	..	..	..	..	..	..	..	..
Hoisting Engineer	..	..	..	..	..	..	..	..	..	55	..	..
Engineers	..	..	..	..	65	..	..	..	..	..	..	..
Experienced Labor	..	..	..	..	..	..	55	..	..	..	..	..
Common Labor	45	50	47½	..	40	..	50	..	..	45	40	..	45
A-1 Men	..	..	..	..	..	..	60	..	..	..	..	..	..
Crusher Men	50	..	52	..	..	..	..	..	..	55	..	..	..
Quarry & Track Men	50	..	47½	50	..	45	..	50	..	..	..	..	..
Pit Men	..	..	..	50	..	..	..	..	55	50	..	..	..
Superintendent	..	..	..	..	..	..	..	..	..	..	60	..	..
Mechanics	50	..	..	..	..	..	..	..	..	..	..	50	65
Tripod Drillers	50	..	..	..	..	..	..	..	..	..	..	..	..
Well Drillers	..	..	49½	..	..	..	..	..	..	..	..	..	..
Electric Drillers	..	..	49½	..	..	..	..	..	..	..	..	..	..
Drill Runners	..	..	..	..	..	..	..	50	..	..	..	..	..
Powder Handlers	50	..	47½	..	..	..	..	..	..	..	..	..	..
Carpenters	..	60	..	..	..	..	..	..	..	..	..	..	..
Drivers—Trucks & Teams	..	..	49½	..	..	..	60	45	..	..	..	..	..
Firemen	..	..	..	..	50	..	..	..	..	55	50	..	..
Car Loaders	..	..	..	..	..	..	..	50	..	..	45	50	..
Switchmen	..	..	..	..	..	..	..	..	..	..	..	50	..
Crusher Tender	..	..	..	..	..	..	..	..	..	..	50	50	..
Hopper Tender	..	..	..	..	..	..	..	..	..	..	..	50	..

How to Get Cars

Manager Sutton Advises Producers of Necessary Steps to Be Taken

ON March 25, E. Guy Sutton, business manager of the National Association Sand and Gravel Producers, sent a letter to the members of the association, calling their attention to the recent circular by the Commission on Car Service, as quoted by our Washington correspondent on another page.

In this letter Mr. Sutton states that he was in Washington previous to the date the circular was issued, and made an earnest appeal for the protection of the movement of sand and gravel for road building work as well as for other purposes during the season of 1920. A co-operative plan was effected with the Commission on Car Service for handling complaints of shippers of sand and gravel, when they are not able to secure a satisfactory car supply from the railroads on which their plants are located. The proposed method of procedure is as follows:

1. Make request for the number of cars wanted through the local agent.
2. If cars are not furnished, apply to the division superintendent.
3. If then cars are not obtained, make appeal to the general superintendent.
4. In the event relief is not granted after taking the foregoing steps, present complaint to the National Association, and your case will be submitted promptly to the Commission on Car Service for attention.

A blank has been prepared on which to make complaint.

In further explanation Mr. Sutton says: "The Commission on Car Service was voluntarily organized by the American Railroad Association. At the present time it serves as the point of contact between the Interstate Commerce Commission and the railroads, and no doubt the relationship will be continued as long as the orders of the Interstate Commerce Commission respecting car service are obeyed by the railroads when transmitted through the Commission on Car Service.

"It is emphasized again that the shippers of sand and gravel should work out their car supply problems, so far as possible, with the officials of the railroads. It can be borne in mind, however, that with war conditions eliminated, all shippers are entitled to share alike in the distribution of available equipment except in the case of an emergency, when so declared by the Interstate Commerce Commission.

"The National Association stands ready to protect your rights with respect to car supply when assistance is required."

Want to Close Quarry In City

One of Chicago's Old Landmarks Opposed by Residents

STEPS were taken recently at a meeting of citizens of the Eleventh ward in Chicago toward the closing of the Union Lime works, one of the oldest institutions in the city, owing to the existing danger from blasting with dynamite.

Two thousand residents of the ward met in response to a call issued by a committee that was organized after an accident at the quarry a few days previously, in which three persons were injured and considerable damage done to property in the vicinity.

The chairman of the meeting voiced a vigorous protest against what he termed "an abominable nuisance," and urged his hearers to appoint a committee to find means by which the quarry could be closed.

Notes of Eastern Producers

Industry Showing Great Activity in Anticipation of Big Business

WITH the passing of the winter months, sand and gravel producers in the New York district are making ready for active spring production. The demand is heavy and the 1920 season bids fair to be one of most unusual proportions. The barren condition of the New York market indicates that production must be on a broad scale for the weeks to come for a replenishing of stocks. Strikes in the building trades have gone to lessen the call somewhat during the past month, but the spring building season, with settlement of labor controversies, looms large, and this branch of trade alone is bound to make ready inroads on available quantities of sand and gravel. Prospective road construction is equally bright and there is sure to be a firm, increasing demand for crushed stone.

Prices show no noticeable variation; present quotations are firm and no appreciable decline is anticipated during the spring and summer seasons. Crushed stone in wholesale quantities has advanced from $1.75 per cubic yard, 1½-inch size, to $1.85 and $1.95 a cubic yard, while ¾-inch material has increased from $1.85, as last recorded in PIT AND QUARRY, to $2.00 and $2.10 per cubic yard. Building material dealers are asking about $3.50 per cubic yard for good crushed stone delivered on the job. Gravel has followed the lead of crushed stone; ¾-inch and 1½-inch material is now selling in wholesale lots at $2.25 per cubic yard, as against $2.00 a few weeks ago. Washed gravel is none too plentiful at the building supply dealers, and prices in this quarter have risen to $3.50 a cubic yard, delivered. Sand still holds at previous quotations, being $1.25 per cubic yard, wholesale, and from $2.00 to $2.25 delivered. Clean white sand of particularly high-grade is selling for $4.50 per cubic yard, delivered on the job. Portland cement shows no change in price, being $3.40 a barrel, delivered.

In the northern New York districts, the outlook for the coming season is very bright, and those in the trade who "keep an eye on things" are quite optimistic. At Buffalo, the Lautz Marble Corporation experienced a fire loss of about $10,000 early in March at its plant at 864 Washington Street; Robert K. Glass is president of the company. The Buffalo Slag Co., Ellicott Square, Buffalo, has increased its capital from $110,000 to $500,000 for proposed expansion during the coming months.

To operate a quarry and slate mills at Granville, N. Y., the Red & Green Slate Products Co. has been organized with a capital of $200,000 by W. J. Wanamaker, 17 Battery Place, New York; J. V. B. Roome and R. E. Jarrett. Extensive production is planned. Another new company, located at Rochester, is the Phoenix Gypsum Co., formed with a capital of $220,000 to operate a quarry, mine gypsum and engage in kindred operations. W. G. Fritz, A. V. Ott and A. B. Van Huben head the organization.

The Utica Sand & Gravel Co., Utica, N. Y., has been organized with a capital of $10,000, to engage in the sand, gravel and crushed stone business in this district. H. H. Buchanan, H. S. Greene and E. E. Sweet, all of Utica, are interested in the company.

There is considerable activity in the industry in the different districts of New Jersey. In the matter of rock production, the Holland Co. is doing some extensive blasting work at its

quarry on Wild Cat Mountain, near Rockaway, N. J. Large shipments are leaving the plant. The General Pulverized Limestone Co., has leased the former power plant of the Eastern Pennsylvania Power Co., at Columbia, and will use the station in connection with its operations in this district. The Empire Steel & Iron Co., Wharton, has been very active during the past weeks in the supply of crushed stone and sand; with good stocks on hand, it has been offering for immediate delivery sizes ½-inch, ¾-inch and 1½-inch, clean and uniformly sized. The Warren Soapstone Co., Phillipsburg, is in steady operation, and increased production is under way; the company has recently installed additional electrical equipment for this purpose.

Two new sand and gravel companies have been organized in New Jersey during the past fortnight. The Kelly Sand & Gravel Co., Mt. Ephraim, has been formed with a capital of $100,000, to operate along production lines in this district; the company is headed by Edward D. and William H. Kelly, and James A. Cogan. At Newark, the Succasunna Products Corporation has been incorporated under state laws, with capital of $125,000, to deal in sand, gravel, crushed stone, etc. The incorporators are: M. E. Robinson and Alexander A. Slavin, Morristown; and W. Furney Jeffreys, Newark. Offices have been established at 523 Essex Building.

Things are opening up in a fine way for big production in 1920 in the various sections of Pennsylvania, and including all related branches of the industry. In the Lehigh Valley districts, the different cement plants are busy and manufacture is being maintained at a good status; the two bad factors of the situation at the present time is the shortage of freight cars for shipments, and the scarcity of bags. A safety campaign is under way in this section, fostered by the cement companies and other local industrial interests; it is proposed to have a "Safety Week" during the second week in May, at which time lectures will be given to show the great necessity for care among workers at the various plants. A portion of the works of the Whitehall Cement Co., Annville, Pa., was destroyed by fire on March 6; the loss was slight, due to prompt action.

Business changes in the Pennsylvania trade during the past month include the sale by the Curtis & Hill Sand & Gravel Co., Commercial Trust Building, Philadelphia, of its properties on the River Road, in Bucks County, aggregating about 42 acres of farm land. The Manor Sand & Gravel Co., Philadelphia, a Delaware corporation, has increased its capital from $50,000 to $200,000 for proposed expansion. The Hudson Sand & Gravel Co., is a new organization formed at Kittanning, Pa., with capital of $25,000, to engage in the sand, gravel and crushed stone business; the company is headed by W. A. Iseman, F. O. Sarver and H. P. Hudson, all of Freeport, Pa. At Bangor, the Bangor Fidelity Slate Co., has been formed with a capital of $75,000, to produce slate and kindred products. Oliver LaBar is treasurer.

There is a most encouraging aspect in the trade in the Pittsburgh district. Despite the severe winter weather during the past few weeks, things have been going forward in a substantial way, for the heavy demands of the various steel and iron companies in this section have acted as a spur for constant activity. The Ohio River Sand Co. has been giving its fleet a complete overhauling preparatory to the inauguration of the regular season.

Use of Bars in Quarries

By DANIEL J. HAUER

STEEL bars are used extensively in quarries for many purposes; but inasmuch as there are many types, sizes and lengths of bars it frequently happens that the wrong kind of bar is used for a given purpose. It is quite surprising how much time can be wasted by a man attempting to do certain work with the wrong tool. For instance, if a man wishes to pry up a boulder from the quarry floor and uses a round-pointed bar meant for breaking down rock from the ledge, he is likely to spend a minute or more

Fig. 1—Crow bar with square bottom

in useless work. With the proper tool the job is done in a few seconds.

Thus a discussion of the various kinds of bars and their uses in quarry operations may prove helpful.

The bars that are meant for use in quarries are of six different types. Figs. 1 and 2 show the two general shapes of bars; namely, the bar with a square base, which extends for about half the length of the bar, with a handle either round or octagonal, Fig. 2 being the one made of octagonal steel. Both of these types can be bought, but the first is the most common one. The second type of bar can be made in any blacksmith shop, putting on it any shape of point desired, except that shown in Fig. 5. For this bar there should be a square base.

One advantage of the octagonal bar is that each end can be sharpened, and

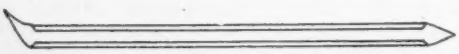


Fig. 2—Crow bar with round point

if desired a different shape made on each end, as shown in Fig. 2.

The bars that are purchased will vary in weight from 8 to 24 pounds, and run from about 5 to 7 feet in length. The most common weights are from 14 to 18 pounds, and the average length a little less than 6 feet. Some bars for use in quarries should be about 7½ to 8½ feet long, and such bars the writer generally has made of octagonal steel in his blacksmith shop.

A bar with a round point, as shown on the right hand end of Fig. 2, is called a lining bar. In Fig. 3 is shown a wedge-shaped bar, while a chisel-shaped bar is illustrated in Fig. 4. In Fig. 5 is shown a bar used for pulling railroad spikes in track construction and removal. The ordinary spike puller without the small attachment to it can be readily purchased, and at times the bar with this attachment can also be bought; but as a rule it is necessary to put this attachment on in the blacksmith shop. The extra cost of it

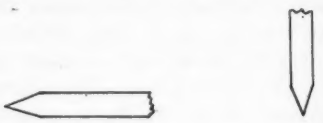


Fig. 3—Wedge-pointed bar

is quickly repaid if there is much spike pulling to be done.

The round-pointed bar in Fig. 2, which is used as a lining bar, with the one just described, makes a complete set of bars for laying, relaying, shifting and lining up quarry tracks, especially when wooden ties are used.

Beside track work, bars are used in a quarry for six or more purposes. When blasts are made on a deep breast there is much stone left against the breast that is loosened but will not

fall down. All of this stone must be broken loose and thrown down with a bar. The one best suited for this purpose is that illustrated in Fig. 2. Both ends are used—the round point for breaking into cracks that are made by the blasting and the crow end for throwing them down to the quarry floor. A man doing this work frequently has insecure foothold and must reach some distance. Thus he should have a chance to select his bars as to length. For long reaches and easy prying with a lever, the lengths should be from 7 to 8 feet. For ordinary purposes a 6-foot bar is needed, while in cramped conditions a much shorter bar may have to be employed.

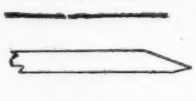


Fig. 4
Chisel-pointed bar

Many large boulders must be pried up from the quarry floor or from the pile of blasted stone. For this purpose the crow bar in Fig. 1 is ideal. This bar, if kept sharpened, can be forced under a boulder in a small crack and has enough heel to raise it to slip another bar under farther, or a small spall. A boulder once started can be handled better with the bars shown in Figs. 3 and 4, for their sharp points stick into the ground more easily without slipping.

These two bars are also adapted for rolling stone or sliding them along the ground, likewise for loading boulders up runways into cars or carts.

These two bars, but more especially the wedge-shaped bar, can be used in helping to break boulders that have been cracked by sledges or blasting. The heavy bar is driven by hand into the crack like a gad and then used as a lever, splitting the boulder open.

For moving machinery and taking heavy parts of the crusher off, the chisel-shaped bar in Fig. 4 is to be preferred. It has enough heel to pry pieces apart and raise up the heavy pieces so that other bars can be brought into use.

In feeding the crushers it is frequently necessary to use bars for ramming stone down or to pry several loose that have become jammed in the mouth of the crusher. For this purpose a bar about 7 feet long made like that in Fig. 2 is the best, for with the two ends both operations can be performed. This same bar can also be used in opening gates of bins when they become tightly wedged with small stones.

Fig. 6—Wooden lever with iron point

In Fig. 6 is illustrated a long wooden lever that can be used for many purposes. This can be made of a sapling, or better still, from an old wagon tongue. On the large end is fastened a heavy iron, making a long, heavy lever or bar. These can be made from 8 to 12 feet long. A lever like this can be used to raise up and roll over large boulders, even several cubic yards in size, as three or four men can use one lever and several more levers can be brought to play upon a single large boulder.

These levers can also be used for moving heavy sections of track and likewise they are excellent for moving heavy machinery.

For moving heavy freight cars, bars are frequently used.

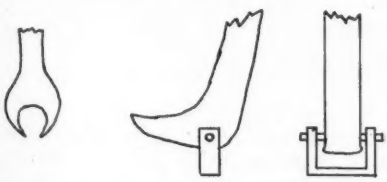


Fig. 5—Three views of spike puller

What Is Waste Granite Good For?

Trying to Find Outlet for Accumulations in Vermont Quarry District

WASTE in the great granite center at Barre, Vt., consists of three types of material: the rough blocks rejected at the quarries on account of imperfections, the chips or spalls resulting from trimming and dressing at the cutting plants, and the granular and pulverized material from the dust collectors.

The waste piles at the quarries are of immense proportions and constitute a serious handicap to quarrying in that they cover up good rock deposits, and are also so large that waste disposal becomes more and more expensive. The problem of utilization of such waste material is a topic of keen interest to all granite producers.

Barre is not situated on a water route, and thus transportation costs prohibit the shipment of waste blocks for rip rap or ballast. Crushing plants use a small amount of this material for road construction, but aside from this, the waste is practically valueless.

Investigators of waste utilization problems are awaiting with interest further information concerning an enterprise undertaken at Montpelier, Vermont, to utilize crushed granite for the production of brick similar to sand-lime brick. Granules of granite are mixed with lime, moulded, and hardened under steam pressure. The brick produced are said to be of excellent quality for structural purposes.

There seems to be no logical reason why waste granite could not be utilized for the manufacture of building stone, and paving blocks, for many of the defects which condemn a stone for monumental purposes are not at all detrimental for building or street paving. For the most part, monumental stone workers are not particularly interested in other branches of the granite industry, and a combination of industries such as that suggested above has not appealed to them.

There is a considerable content of potash in Barre granite, as in all granites in which orthoclase is the predominating feldspar, but as the potash is present in silicate form, it is difficult to separate. Many patents have been taken out for the recovery of potash from feldspar, but operation on a commercial scale is yet in the future.

A process of mechanical separation of mica from granite dust, and utilization of the remaining mixture of quartz and feldspar in the ceramic industries is now in the experimental stage.

Pulverized granite may be used in abrasive soaps, for poultry grit, and as filler in such products as roofing and fertilizer materials, but markets that consume any considerable quantity of granite for such purposes have not yet been established.

While the problem of utilization of waste granite is at present largely unsolved, there are evidently a number of avenues for useful application of the materials that bear sufficient promise of their utility to justify careful consideration and study. Suggestions regarding any phase of the problem of waste granite utilization will be welcomed by the Bureau of Mines, Washington, D. C.

A new Cleveland incorporation is the Concrete Material & Sand Company. The capital is $300,000, and the incorporators are B. L. Benfer, A. C. Carter, E. R. Bayes, L. E. Giel and E. M. Kossin.

H. T. Hamilton, Ithaca, N. Y., says truck does work of five teams

Hamilton Believes in Trucks

Overloads It Most of the Time in Hauling Sand and Gravel.

H. T. HAMILTON is in the sand and gravel business in Ithaca, N. Y. His 2-ton Acme truck, with special dump body, is shown in the above illustration.

Mr. Hamilton is an enthusiast in the matter of truck delivery. He carries 2 yards of sand at a load, averaging 50 to 60 miles per day, sometimes on grades as high as 16 per cent.

"My truck," he says, "is doing the work of five teams on short hauls, and seven teams on longer hauls. I perhaps have overworked my truck. It is overloaded most of the time about 1,000 pounds. On one occasion it carried 7,200 pounds, which it handled fine, but I drove it very carefully.

"I drive from 15 to 18 miles per hour.

"As to pulling power, the other day I hauled out a mixer stuck in the road which two teams were unable to pull. At the time I had 2 yards of screened gravel on my truck, weighing around 5,200 pounds."

New incorporation in the sand and gravel industry is the Bloomfield Washed Sand and Gravel Company, Greenfield, Ind., capitalized at $100,000, to do a building materials business. The directors are: Marion E. Dugger, Ernest H. Dugger, Otto E. Dugger, Palmer Boles and Glenn V. Gladville.

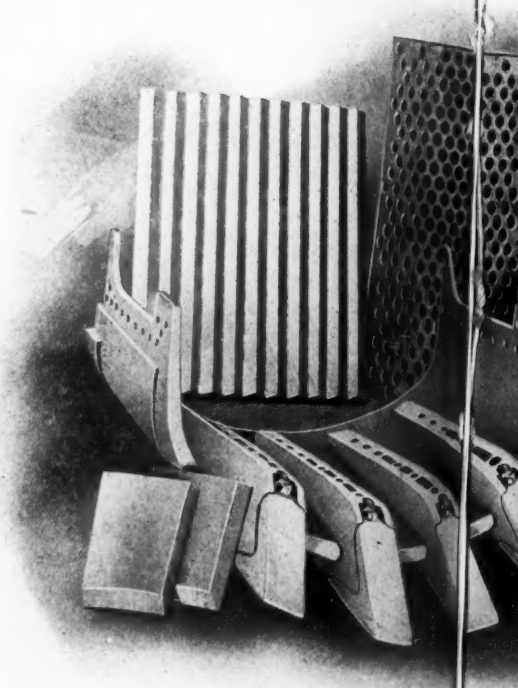
TISCO MANGA

To the Producer

NOW
IS THE
TIME
TO PREPARE
FOR HARVEST

How Prepare?

BUY TISCO
MANGANESE
STEEL FOR
WEARING
PARTS FOR
YOUR CRUSHING
MACHINERY



In the illustration is shown a steam ovel dip reversible dipper teeth for a 2½-yard di r. Sim steam shovel parts of manganese are als ade for dippers. The manganese crusher parts own inc crusher head, concaves or staves, and h ers fo

We Can Take Care

Prompt delivery, frequently from stock, can be made of all kinds of wea ng pa buckets; lips, fronts, Panama reversible dipper teeth, etc., for steam s vels;

TAYLOR-WHARTON IRON &

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steam ovel dipper front equipped with Panama
yard dip r. Similar fronts and teeth with other
are also ade for any and all makes and types of
parts own include a jaw plate, screen plate,
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A repair job **with TISCO Manganese Steel wearing parts is better than a complete new equipment with other materials.**

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PARTS WITH TOUGHNESS, STRENGTH AND RESISTANCE TO WEAR ARE REQUIRED. TISCO MANGANESE WILL REDUCE BREAKDOWNS AND SHUTDOWNS TO A MINIMUM

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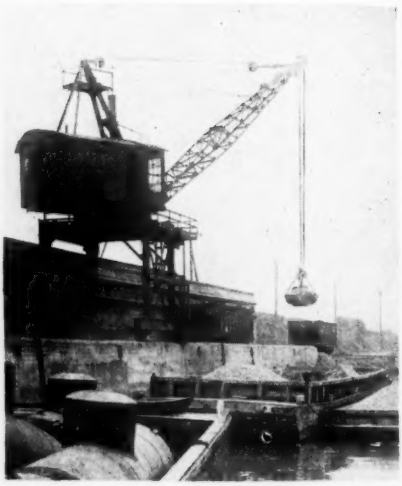
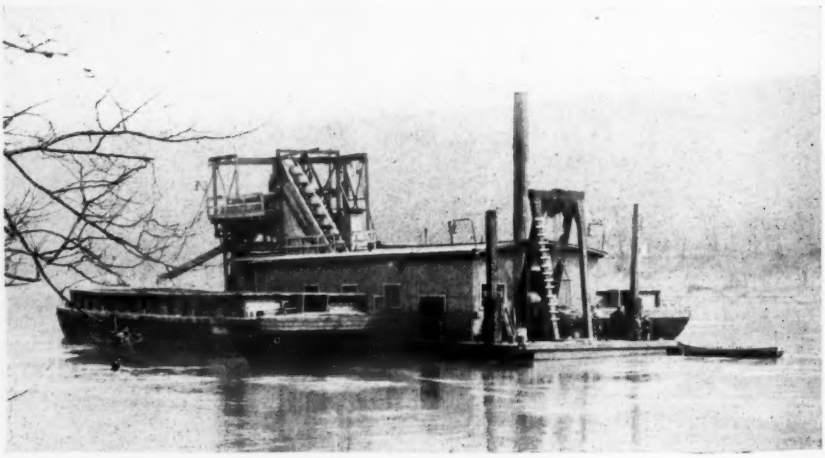
eam s vels; hammers for pulverizers of any standard make.

ON & STEEL COMPANY HIGH BRIDGE, NEW JERSEY





Boats and unloading equipment of the Keystone Sand and Supply Company, Pittsburgh, Pa.

Getting Sand from the Rivers Around Pittsburgh

Extracts from a discussion before the National Association of Sand and Gravel Producers.

BY A. W. DANN

of the Keystone Sand Supply Company, Pittsburgh

THE Allegheny and the Monongahela rivers, as a rule, where the material has not been depleted, have a deposit of possibly anywhere from 20 feet to 50 feet of sand and gravel in the bottom. That sand and gravel, in a great many instances is filled up with boulders. Those boulders run all the way from the size of your fist up to boulders which will weigh a couple of tons.

Another condition which we have there is that this material in the bed of the river is very closely cemented; that is, it makes a sort of natural concrete in a great many places, so that even with the lighter gradation which we use it is sometimes difficult to break the surface at the bottom so that we can start getting up the material.

These are two reasons to account for the fact that pump boats are not used there. Probably a third reason is that the original producers there, when they first started the production of sand and gravel, which was in the 80's, developed the ladder boat, which all the companies have since adopted, the belief being that it is a more economical boat to use than the pump boat.

I will describe one of these boats briefly. First, however, I will say that the type of boat is substantially the same in all cases, but certain variations are made by the different companies. All of the boats, with the exception of those used by our company, are what are called the self-movable boats, that is, they resemble the ordinary stern wheel steamboat, having a comparatively small wheel. The boat under ordinary conditions can move itself back and forth around the river, although with any conditions of current it is not able to navigate very safely. Again, it is not able to take its barges with it. The type of boat which we use has no wheel at all. We depend upon a steamboat to move this boat back and forth, unless it may be just for a short distance, and then it pulls itself on a line or works itself around with spuds.

I will describe our No. 4 boat, which is the largest one we have. This boat at present has a hull 127-foot long by 30 feet wide and it is 6½ feet deep. It is all made of steel. We are at the present time having that particular boat on the ways and increasing the width by 8 feet and the length by 15 feet. That boat weighs, with all the machinery on it, approximately 650 tons.

The principle of the ladder boats, as most of you probably know, is the endless chain system of digging; that is, we have a ladder which is hinged to a shaft up in the middle of the boat. Then there is a channel left open down through the center of the boat about two-thirds of the way, and that allows this ladder or frame on which the buckets run to be lowered or raised, to reach the digging, by means of a head frame at the end of the boat. In our individual case we use a ⅞-inch line with nine parts of line, so that you can see the thing is pretty heavy. We have on that chain

close-linked buckets. That means that there is no intermittent link, as is quite common in practice. The buckets form the link, which means a continuous stream of material coming up. We have 83 buckets. Each bucket will hold approximately 6 cubic feet. Each of the buckets weighs approximately 850 pounds. These buckets, as I said before, and the whole frame, are lowered to the bed of the river.

We will say, for instance, that we are starting to dig in a new place. This frame is lowered down on the material, and the engine is started. Of course, this bucket just digs its way. This chain of buckets digs into the material and brings it up. This chain has such a speed that we dump 26 of those buckets every minute onto the "harp." Now what we call the harp is the grate or screen. It is simply a series of bars at the head of this frame up high in the boat upon which the larger boulders which have been brought up in the buckets are deposited and allowed to run back directly into the river. If we are digging much mud, if we happen to run into a bush, or something like that, that bush or tree or whatever it might be, will be caught on this grate and put immediately back on a slide or bootjack so that it doesn't get into the screen. Any material that passes on through what we call the harp goes immediately into the screen. This screen on this particular boat has an effective working length of about 25 feet. It is a jacket screen, as is of course common practice in that kind of an operation.

To start with, as this material goes into the screen it is met by a stream of water from a 10-inch pump. It is put through the screen. The finer material is supposed to pass through the inner screen and be deposited on the outside jacket within about the first 12 feet. Then the sand is screened out of the coarser material. I mention that to show that the heavy material is not dumped on the jacket at all. It is carried on through. That saves the sand screen very materially. Then the sand runs to one side and the gravel passing on and being dumped, is allowed to pass through the perforations in the plates. We use steel plates perforated and bent to the proper angle to form the circumference. The sand passes on one side and the gravel out the other. On each side of the boat we have what you might call a sump. We call it simply a vat, a sand vat or a gravel vat. Each of the different materials passes to its respective vat. Passing through the vat there is a continuous stream of water running from the screen and also auxiliary pumps throwing more water in there, the object being, of course, to again wash the material. The idea is to wash the material twice. This sediment, that is, the mud and silt is stirred up continually by the other elevator chains that come up; that causes the silt to run overboard on each side of the boat.

We have another ladder, another frame with a string of buckets. It is built substantially the same, having digging buckets, except that they are smaller. We have 51 of these buckets on one side, and 50 on the other. They elevate the material and deposit it in the chute, and it goes out on the side of the boat. We have a barge on either side; one barge catches the gravel and the other catches the sand.

The principal thing about our plant, I believe, as compared to the ordinary pumping proposition, is that our whole operation, as far as manufacturing goes, is in one place. We take our manufacturing plant right with us. If on occasion we have to move up or down the river a considerable space, that does not in any way affect our

loading plant. We are able to tow that up or down the river and unload it. As a matter of fact, we utilize the islands. The most of our digging is from the side of islands. That means that the projecting end of our ladder is out beyond the end of the boat, so that we can go right into the side of the island and rip a hole in it and load the material.

We have also another type of boat. I will not take the time to describe that at all in detail, except to say that there are two different types of boats, or two different variations of one type, I might rather say. One is the high screen and the other is the low screen. The one which I have described is the low screen boat, which is desirable for keeping the center of gravity as low as possible so that the weight will not upset it. The other is the high screen, in that the digging chain is more nearly horizontal. The dumps are lower. The material runs at once into a sump. It is washed in this case before it is screened. The materials, after they have been washed and agitated in this sump or tank, are elevated by an elevator ladder and then taken through the screen in the same way as before, except they don't have a harp. They pass through the screen and there again they are washed by the water under pressure, getting the materials divided by the ordinary process, the sand going one way and the gravel the other, and there again it is completely manufactured.

As to the capacity of this boat, that might be of some interest. This larger boat of which I have just spoken has a 150-horsepower engine on it. The best record we have for it is in a period of a little bit over ten hours we dug, washed, screened and loaded on barges 4,250 tons. The ordinary capacity of this boat we call something around 300 tons an hour. There are other boats which are smaller. The capacity of our other two diggers is approximately from 1,500 to 2,000 in 10 hours. I mentioned the power which is used on there. That will compare very favorably with the power used in any pumping proposition of the same size, when you stop to remember that the 150-horsepower engine not alone digs the material but it washes, it runs the pump to wash, it runs everything on the boat except the lighting plant, turns the screen, and elevates the material so that it runs out on the barges.

Just one more point, I believe, might be of interest; that is as to the type of equipment which we used in general. Our company has adopted as standard practice the use of steel in barges. We have some wooden barges left but we are replacing them as rapidly as possible with steel barges. We use what we call the flush-deck barge as against the hopper barge. The flush-deck barge has this advantage, that whatever water may come out with the sand or gravel runs off the deck of the barge through limbo holes in what is known as cargo bodies, that is, just the box effect on top of the deck that holds the material. We are through with that water, it doesn't interest us any more, whereas in the hopper type of barge the material is down below the surface of the water. The deck of the barge and the bottom of the barge are only 18 inches or so apart and with the use of that type of barge a large expense is entailed for pumping the water out again. It seems better to let the water run off by gravity than it does to pump it out.

The Newberg Sand & Gravel Company, of Salem, Ore., filed articles of incorporation. The capital stock is $20,000. The incorporators are Paul B. Wallace, Roy H. Mills and Joseph H. Alberts.

Lime Production for 1919

About 2,976,000 short tons of lime of domestic production was sold in 1919 in the United States, including Porto Rico and Hawaii, according to an estimate made by Herbert Insley from returns furnished by the principal producers to the United States Geological Survey, Department of the Interior. The quantity reported is 7 per cent less than that produced in 1918 (3,206,016 short tons), which was 15 per cent less than that produced in 1917. The greatest production recorded for the United States was that of 1916—4,073,433 tons.

Of the forty States and territories producing lime in 1919 seventeen increased the output and nineteen decreased it as compared with 1918. The output of four remained about the same. The accompanying table shows the estimated quantities of total lime and hydrated lime sold in all States that produced more than 20,000 tons of lime in 1919. The final figures for 1918 are also given, for comparison.

The sales of hydrated lime in 1919 amounted to about 740,400 short tons, an increase of 19 per cent over those in 1918—620,216 tons—and of 3 per cent over the previous record quantity of 1916. This recovery from decreases in 1917 and 1918 is in marked contrast to the continued decrease in the total sales of lime. The production of hydrated lime was reported by manufacturers in twenty-nine States. Three of these States—Arkansas, Nevada, and Oklahoma—had never before resumed production of hydrated lime, and two—Iowa and New Jersey—resumed production after a lapse of at least two years. Of the remaining States nineteen showed an increase in production in 1919 as compared with 1918, and five showed a decrease. Of the large producing States by far the greatest relative increase was reported from Maryland, which made an increase of 75 per cent over its output for 1918.

Building Lime

With very few exceptions, all the manufacturers of lime reported that 1919 was a much better year than 1918 for the sale of building lime. Practically all agreed that the demand was poor during the first half of the year—almost as poor as in 1918—but that the demand increased very decidedly during the last half of the year. Two or three producers reported that the demand for building lime in the last half of the year of 1919 was greater than ever before. Although most contractors, as well as others, realized the serious shortage of houses, the confusion that followed the end of the war prevented the immediate revival of building, and no real effort was made to supply the demand for houses until about June, 1919. Barring financial difficulties, there seems to be no reason why the renewed activity of the building industries should not continue for at least five years or longer.

Chemical Lime

The peace-time chemical industries, like the building industries, took some months to recover from the confusion that followed the signing of the armistice, which ended all demand for lime for war industries. The demand for chemical lime in 1919 was fair to poor, but the producers in several States nevertheless reported an increased demand for chemical lime, especially in the last half of 1919.

Agricultural Lime

Producers reported that the average demand for agricultural lime in 1919 was about the same as the demand during 1918. The demand for burned lime for agricultural use has steadily declined during the last few years.

Other Lime

The reports of producers showed great differences as to the trade conditions for lime used in other than the chemical, building, and agricultural industries. This difference was due largely to the fact that producers sold their lime to different industries, such as sugar factories, paper mills, glass works, smelters, steel works, and tanneries, their market depending on their geographic location and other facts.

The demand for lime used in metallurgy in 1919 apparently continued about the same as in 1918. One western company reported that the consump-

Lime produced in the United States in 1919 and 1918.

[Estimate for 1919; final figures for 1918.]

State.	Total lime.		Percentage of gain or loss in 1919.	Hydrated lime.		Percentage of gain or loss in 1919.
	Quantity (short tons).			Quantity (short tons).		
	1919	1918		1919	1918	
Pennsylvania	675,100	801,834	−16	156,500	133,583	+17
Ohio	465,000	489,893	− 5	284,000	234,902	+21
Virginia	222,800	249,990	−11	(a)	(a)	+ 4
Missouri	184,700	201,737	− 8	36,000	34,942	+ 3
Michigan	141,700	134,813	+ 5	(a)	(a)	−36
West Virginia	135,000	167,901	−20	44,780	46,485	− 4
Massachusetts	133,780	123,697	+ 8	9,010	(a)	.....
Wisconsin	128,200	109,303	+17	24,680	16,883	+46
Tennessee	113,200	106,527	+ 6	21,650	19,265	+12
Indiana	108,000	116,321	− 7	32,130	24,574	+31
Maryland	103,250	106,737	− 3	44,130	25,218	+75
Maine	94,700	83,034	+14	(a)	(a)	.....
New York	64,130	87,127	−26	(a)	(a)	+30
Illinois	62,530	64,672	− 3	(a)	(a)	− 7
Alabama	50,500	49,209	+ 3	6,500	6,327	+ 3
Texas	50,000	45,206	+11	18,940	15,594	+21
Connecticut	(a)	(a)	.....	(a)	(a)	+34
California	36,500	55,588	−31	(a)	(a)	−30
Vermont	38,080	35,728	+ 7	(a)	(a)	.....
Washington	21,950	22,118	− 1	(a)	(a)	−38
Undistributed	144,880	154,581	.....	62,080	62,440	.....
	2,976,000	3,206,016	− 7	740,400	620,216	+19

a Included in "Undistributed."

Lime produced in the United States in 1919 and in 1918, by districts.

[Estimates for 1919; final figures for 1918.]

District.	Producing States or parts of States.	Quicklime (short tons).	Hydrated (short tons).	Total for 1919.	Total for 1918.	Increase or decrease in 1919.	
						Total lime.	Hydrated lime.
1	Maine, Vermont, Massachusetts, Connecticut, Rhode Island, eastern New York	341,450	29,510	370,960	380,311	*Per cent.* − 2	*Per cent* +11
2	Eastern Pennsylvania, New Jersey, Maryland, eastern West Virginia	465,000	226,730	691,730	871,890	−21	+23
3	Western Pennsylvania, western New York, western West Virginia	206,790	27,280	234,070	211,332	+11	+29
4	Virginia, North Carolina a	222,800	(b)	222,800	249,990	−11	+
5	Ohio	181,000	284,000	465,000	489,893	− 5	+21
6	Michigan	141,660	(b)	141,700	134,813	+ 5	−
7	Illinois, Indiana, eastern Missouri	235,400	67,370	302,770	322,596	− 6	+21
8	Wisconsin	103,520	24,680	128,200	109,303	+17	+46
9	South Dakota, Minnesota, Iowa	22,750	(b)	22,750	(c)	−	−
10	Kentucky, Tennessee	93,390	21,650	115,040	108,411	+ 6	+12
11	Alabama, Florida d	44,000	6,500	50,500	49,209	+ 3	−
12	Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas, Louisiana, Wyoming, Colorado	64,920	8,490	73,400	77,838	− 6	−
13	Texas, New Mexico	35,160	18,940	54,000	47,496	+14	+21
14	Western Montana, Idaho, Utah, Arizona, Nevada, Washington, Oregon, California	73,100	8,190	81,290	111,729	−27	−24
	Undistributed e	18,670	3,120	21,790	41,205	.....	.....
		2,235,670	740,400	2,976,000	3,206,016	− 7	+19

a Virginia only; North Carolina included in "Undistributed."
b Included in quicklime.
c Included in d Undistributed."
d Alabama only; Florida included in "Undistributed."
e Includes Hawaii, Porto Rico, North Carolina, and Florida.

tion of lime in smelters increased two and a half times; another company in the same district reported a marked decrease in the lime sold to smelters. A good demand, better than normal, was reported by most of those selling lime used in the glass, sugar, and paper industries. The production of refractory lime, which is principally dead-burned dolomite, declined greatly

in 1919. Less than half as much dead-burned dolomite was produced in 1919 as in 1918. As head-burned dolomite is used principally in lining basic open-hearth furnaces the decline in its output, though not definitely explained by the producers, is attributable chiefly to the cessation of the demand for steel for military use and to the steel and coal strikes in the last few months of 1919—causes that decreased the production of steel in 1919 about 27 per cent and that reduced correspondingly the demand for dead-burned dolomite. The expectation of a renewal of imports of magnesite from Austria also influenced the producers of dead-burned dolomite to reduce their output. In 1918 the production of dead-burned dolomite increased much faster than the production of iron and steel, so that at the end of the year the manufacturers of steel had on hand an oversupply of dead-burned dolomite. The sales of dead-burned dolomite in 1919 were much greater, however, than the sales in either 1914 or 1915.

Conditions in Commercial Districts

The accompanying table shows the estimated quantities of lime produced in the fourteen commercial districts outlined in 1919 by the Lime Association, as well as the production of those districts in 1918.

Economic Conditions

The decrease in the demand for lime was not the only or even the principal fact that controlled the production of lime in 1919. The high cost of raw materials and tools, the scarcity and poor quality of labor and the high wages forced up the selling price, and a shortage of shipping facilities greatly reduced the output of some manufacturers. Practically all manufacturers reported a higher selling price in 1919 than in 1918, and many complained of the shortage of labor and of its poor quality. The shortage of cars that prevailed throughout the war continued in 1919. In the spring and early in the fall producers were seldom able to get as much as half the number of cars they required. As a rule the actual number of cars supplied ranged from 3 to 40 per cent of the producer's normal needs. Even in the dull season it was difficult to get the cars needed. Under favorable conditions the producers could supply a demand much greater than that made in 1919.

Increases in Six Districts

Six districts — the third, sixth, eighth, tenth, eleventh, and thirteenth—showed increases in the production of all lime in 1919 as compared with 1918. The greatest increase—17 per cent—was made in the eighth district. The greatest increase in the quantity of hydrated lime produced—46 per cent—also was made in the eighth district. Eight other districts also showed increases in quantity of hydrated lime produced.

Nearly all the companies in district No. 1 reported higher prices in 1919 than in 1918. In all the States in this district the demand for building lime was much better than in 1918. In general the demand for chemical lime was less in 1919 than in 1918 except in Vermont, where it seemed to be as good if not better. The demand for agricultural lime remained about the same. The demand for lime for other uses was better in Vermont, Massachusetts, and New York. No reports on lime of this class were received from the other States in the district. This increase in demand in 1919 may have been due in large part to the increased use of lime in paper mills, as a large percentage of the lime produced in New England is usually sold to paper mills. The single producer of dead-burned dolomite in New York State reported a normal demand for this product.

In district No. 2 the trade conditions appeared to be better than in 1918. About one-fourth of the output is used in agriculture. Most of the producers reported that the demand for agricultural lime was the same as in 1918 or better. A smaller percentage of the production of this district (from 10 to 15 per cent) is used as building lime. The demand for lime of this class was generally much better than in 1918. The demand for chemical lime was not use in agriculture. Most of the lime so good as in 1918, but the demand for lime for other purposes was about the same.

In district No. 3 prices seemed to be generally a little higher although several producers reported lower prices. The trade conditions in this district were about the same as in district No. 2. The demand for building lime was

better, for chemical lime about the same or a little less, for agricultural lime about the same, and for lime for other purposes a little better.

The only producing States in district No. 4 are Virginia and North Carolina, and as North Carolina has less than three producers and the publication of its figures would reveal the production of individual companies, the production of Virginia alone has been used to represent that of the district. About half the producers in this district reported higher prices in 1919, three reported lower prices, and the rest reported that prices were about the same. In other years more than half the lime produced in this district has been sold for chemical uses. The demand for lime of this class has apparently decreased somewhat, and it is perhaps this decrease that has reduced the total production of the district. The demand for building and agricultural lime was good and that for lime for other uses was normal. The shortage of coal in December forced several producers to shut down their plants altogether for that month.

Higher Prices in Ohio

In district No. 5, which includes only the State of Ohio, most of the producers raised their prices in 1919 and the average price was higher than in 1918. Only two producers reported lower prices. About half the lime produced in Ohio is normally used for building. All manufacturers reported a great demand for building lime, estimates of the increase ranging from 10 per cent up to "the best demand for hydrated lime in the history of the industry." The demand in some places was light during the first half of the year but invariably increased greatly in the last half. Scarcity of labor and shortage of cars often prevented producers from filling orders. The demand for chemical lime remained in general about the same as in 1918, although one producer reported a decrease of 25 per cent. The demand for agricultural lime was about the same as in 1918 or a little better. There was a slightly better demand for lime for other uses.

In the sixth district, which includes only the State of Michigan, the reports of the producers indicate that the price remained about the same. About 80 per cent of the lime produced in this district was sold for chemical uses during the war. The fact that there was a slight increase in the quantity sold in 1919 as compared with 1918 indicates that the manufacturers were able to supply an increased demand for building lime and for chemical lime for peace-time industries. Only a small quantity of lime was sold for agricultural or other uses, and therefore no marked change in the sales of lime of these classes was apparent.

In district No. 7 in general higher prices prevailed, although one company in Indiana reported lower prices. The output of this district is fairly well divided among several industries. In 1918 about 20 per cent was sold for building lime and the percentage for 1919 was probably much higher. In this district, as in others, the demand for building lime was stronger in 1919 than in 1918, although one or two companies reported a decreased demand. During the war about 25 per cent of the output of this district was sold for chemical uses, but in 1919 most of the producers reported a decreased demand for chemical lime. Only a small quantity is sold for agricultural use, so that no notable changes were recorded in the sales of lime of this class. Most of the lime sold in this district is used for other purposes than those mentioned. A large quantity is sold for use in metallurgy, paper making, the purification of water, and the manufacture of soap. Producers reported unchanged trade conditions for lime sold for these uses.

In district No. 8 about 83 per cent of the output in 1918 was building lime. All producers reported higher prices and correspondingly increased costs of production. Practically all producers reported a much greater demand for building lime, although a strike in the building trades caused a slack period of short duration. The demand for chemical lime remained about the same. Very little of the lime shipped from this district is sold for used for other purposes than those mentioned is sold to paper mills. Producers in general reported a better demand for lime of this class and one reported an increase of 25 per cent in the sale of hydrated lime to paper mills.

In district No. 9 prices advanced slightly in 1919. Most of the product in this district is building lime, but a small quantity is sold for chemical

uses. Very little lime is sold for any other purpose. During the first half of the year the demand for lime was very poor, but during the last half it gradually increased as building operations began.

In district No. 10 nearly all the producers reported increases in prices. In other years at least one-third of the lime produced there has been sold for use in buildings and the demand for building lime was much greater in 1919. The demand for chemical lime was not so great as in 1918, probably because many plants that manufactured war materials were compelled to close. The demand for lime for paper mills seemed to be good, and one producer reported a much better demand for lime for sugar factories.

In district No. 11 prices were higher. More than half the product in this district is building lime. In 1919 the demand for lime of this class was better than usual. As Florida has less than three producers, its production is not included in that of the district. One producer in Florida reported that the demand for both building lime and agricultural lime was far greater than the supply.

In district No. 12, as in other districts, the average prices were higher, although several producers maintained the same scale of prices as in 1918. More of the lime produced in this district is sold for building than for any other use, although large quantities are sold for chemical, metallurgical, and other uses. Relatively little lime is sold to paper mills, sugar factories, or for agricultural use. The sales of building lime increased, especially during the last half of the year. One producer reported that the demand for building lime was very dull during the first six months but that during the last six months it was the greatest in the history of the lime industry. There was a marked decline in the sales of chemical lime, due to the closing of the war industries. The demand for lime for agricultural and for other uses remained about the same.

In district No. 13, which includes Texas and New Mexico, the average price was higher. In this district the demand for building lime, which constitutes at least 65 per cent of the output of this district, was generally greater than in 1918. One producer reported a decreased demand for lime for all uses. Lime for chemical uses makes up only a small percentage of the output of this district, but most of the producers reported an increased demand for it. The sales of lime for agricultural and other uses remained about the same.

District No. 14, which includes all the territory west of the Rocky Mountains, showed a greater decrease in production than any other district, both in total lime and in hydrated lime. Oregon increased greatly its small production, and Arizona showed an increase of about 1 per cent, but the other States in the district decreased their production. Nearly all the producers increased their prices, yet one producer in the State of Washington reported that prices were too low to give a fair profit because of the importation of lime from British Columbia. In this district in general the demand for building lime increased and that for chemical lime remained about the same. The demand for agricultural lime seemed to be slightly better than in 1918, when it was poor. A large percentage of the lime sold in this district is used by smelters and by sugar factories. One company reported a marked decrease in the smelter trade, but another reported that consumption by smelters increased two and a half times. A producer in Washington reported a very good demand for lime by paper mills.

The Richmond Silica Sand Corporation of Norfolk, Va., is preparing the erection of a large plant near Mendota, Va., for the purpose of preparing sand for use in the manufacture of glass. Mr. P. L. Parker, local manager for the company, stated that preparations for erection of a large modern plant would begin at once. The capacity of the plant will be about 250 tons of silica sand daily, and it is expected that operations will begin about July 1 of this year.

The capital stock of the Leesburg Silica Sand Company, New Castle, Pa., has been increased from $8,000 to $23,000.

The Raleigh Granite Co., Raleigh, N. C., has increased its capital from $50,000 to $250,000 for proposed expansion.

Trouble With Wet Stone

This Producer Wants to Know What to Do to Remedy It

The following letter was received not long ago from a large stone company:

We are having some trouble in getting a clean product in the smaller sizes of crushed stone from our screens on damp or wet days. Our present tonnage of these sizes is as follows:

5.6 tons per hour of ¼ inch to 0.
5.7 tons per hour of ¼ to ½ inch.
7 tons per hour of ½ to ¾ inch.

We are anticipating recrushing our next largest size, which is ¾ to 1½ inches, down to the above mentioned three sizes. We are interested to know if by mixing this recrushed material, which will amount to 22.1 tons per hour and which will be comparatively dry, with the other three sizes of damp material, sufficient absorption will take place to enable us to get a cleaner product than we are now getting. The dry and wet material would, of course, be mixed together before being placed on the screens handling these sizes.

This letter was referred to a quarry expert and his reply to the question is as follows:

The information given by these people is very meager so that it is a little difficult to advise them carefully. For instance, they do not state the size and type of their crusher, the length of their elevator, the type of screens, and whether or not the crusher and elevator are housed. I judge from the information given that their crusher is of such size as to produce 50 to 60 tons of all sizes of products per hour.

With a short elevator and a long set of screens, damp products will not dry out much; but, with a long elevator and screens one set inside the other, better results are obtained. I find that a large number of operators house their elevator, but do not have a roof over their crushers.

If these people who have their crushers exposed would build even a shed over them, it would be a help to them. They may make further improvements by changing the type of the screens.

All these things, though, mean additional capital investment; and I doubt very much if they care to apply such remedies unless they are contemplating rebuilding or remodeling their plant.

Their own suggestion as to recrushing the next largest size and again mixing it with the smaller size would in my opinion help them very little. It would be a help in not making the finer stuff, when it is screened, quite so dirty; but, on the other hand, they would have four sizes with dirt in it instead of three.

My experience is that it takes at least three times the bulk to absorb enough moisture to make it all fairly dry and they have very little more than one additional measure of bulk. So I do not believe that the remedy they suggest would help them.

My suggestion would be, if they are not going to make any changes in the plant, to keep down in their quarry a large amount of blasted stone, and, on damp and wet days, instead of cleaning up the quarry floor of coarse and fine stuff as they go along, which is customary, they only pick up the coarse pieces and especially fair sized boulders that will go into the crusher, leaving the finer material spread out as much as possible so as to dry quickly when the sun comes out, and this mixed with only a fair amount of larger stuff on a dry day will give them a well screened product both on wet days and dry days. I have used this method successfully, but it means the exercising of judgment and continual vigilance of the foremen and superintendent in looking after the men working at the breast of the ledge.

It is always a disadvantage to keep down the excessive amount of blasted rock, due to the fact that future blasting is sometimes impeded; but, with care and judgment, difficulties in this connection can be overcome and it is certainly a paying investment to have ample rock blasted so as to keep a quarry in operation over a wet spell.

The Texas Stone Crushing plant at Chico, Texas, which is approaching completion, will have a capacity of 60 to 80 cars of crushed stone daily. Forty-five carloads of equipment have been received and other machinery is enroute. The company is installing an individual lighting system and will soon begin the building of homes for its employes.

General Methods of Developing and Working Grade Quarries

A Discussion of Developing and Operating Quarries of This Type by Three Different Methods, with Some Remarks upon Blasting and Other Features

By Daniel J. Hauer

Grade quarries are those opened upon the same level or approximate level of the mill or crusher plant. This means that the ledge is in a hill or mountain, and the opening is made in the side of the ledge. This gives a dry quarry; for even should the ledge be wet, if the grade of the quarry floor is looked after, the water as it comes from the ledge will flow off, and thus all pumping is eliminated. This is one advantage that grade quarries have over those in pits.

Another is that less power has to be used to transport the product to the mill. The fact is that in many small quarries, and even some large ones, with gradients running down from the ledge to the crusher, men are able to handle the cars. In this type of quarry it is possible to handle the product in three ways:

1. By Vehicles.
2. By Cars.
3. By Cableways.

Vehicles

Both carts and wagons are used in quarries. The writer has never known auto-trucks to be used for this purpose, yet he believes the one- and two-ton size, with a dump body, would prove economical, especially if some type of power loader is employed. The hauls are too short for a large capacity truck, as the time of loading would be too long as compared to to the time of making the round trip.

The cart in general use is the one-horse dump cart. It is generally used either without a tail gate or with a narrow piece of board for the gate. The load it carries is little more than half a ton. For that reason it is hardly economical either as compared to a wagon or small car. A two-horse wagon hauls from 1½ to 2 tons, while small cars take a load from 1 to 2 tons. Two horses on a wagon with one driver pull twice the load that two horses with two drivers pull with carts, while one horse and driver can pull as much as 2 tons in a small car. Thus cars are cheaper to operate than vehicles.

In developing and working a quarry with vehicles the exact shape and level of the floor make little difference. The tendency is not to develop and work the quarry along good and economic lines, but in rather irregular shape. The reasons for this is that wagon roads can come down steep grades and twist and turn around boulders, piles of overburden and holes in the floor. The ledge can have projections left in it, and be developed along either a straight line or a curve. It is also possible to make the face of the quarry run in any direction desired and not to be in the direction of the crusher. One advantage of this is that less damage is likely to be done to the plant in blasting.

It is also a common practice when vehicles are used in quarries to throw most of the overburden onto the quarry floor and haul it away in

the vehicles, instead of stripping the ledge. This means that some of the overburden may be shot down in a blast, when the dirt becomes mixed with the stone, which is poor practice, often interfering with the sale of the products, or that the overburden is handled twice, a costly method of removing this waste material. Carts and wagons can be used on top to strip the ledge.

One advantage of vehicles over cars in working a grade quarry is the ease with which the vehicles can be moved from one part of the quarry to another. With cars, either new tracks must be laid or old ones must be taken up and relaid.

Working With Cars

In spite of this, cars are to be preferred, especially if the quarry is developed and worked along well thought out plans. Then there should be no reason for changes from one part of the ledge to another, for the blasting can be done to keep the entire trackage in use, and gradually to develop the ledge so that the track system is expanded without any great expense.

A large number of quarries using cars are developed in circular form, the tracks being like the ribs of a fan. This is not necessary as it is possible to keep it rectangular in shape as is frequently done when steam shovels are used to load the cars. Then, too, another way to develop a quarry is in pockets; that is, to have one or more sets of tracks dividing out into loading tracks, and as the quarry is expanded the various pockets will be connected up until there is a well developed ledge giving room for handling a large output.

There are a great many types of cars that are used in grade quarries. Those in pit quarries are generally of 1 or 2-ton capacity and arranged to dump through one end as the car is tipped up to dump.

These cars can be used in grade quarries, but are not necessary as the car is kept about level. The method of loading sometimes decides the type of car to be used, yet this does not always follow, for in some quarries where hand loading is done high cars, that are expensive to load, are used instead of a low type of car. If power shovels, derricks or cableways are used to load cars, the height of the cars matters little, but for hand-loading only a low car should be used. The method of feeding the crusher should decide upon the dumping feature of the car. It is a fact that in many quarries the dumping arrangements are made to suit the cars instead of adapting everything to feed the crusher so that a large capacity may be obtained from it.

The loading of cars by hand is done in even many large quarries; and by means of piece work, tasks or bonuses are loaded comparatively cheaply; but where large capacities are obtained the cheapest way is by means of power shovels. It is by such machines that quarries are developed better and quicker. This has been demonstrated by the cement companies, who have obtained larger output with steam shovels than by any other methods. In fact, power shovels are also being used in pit quarries and likewise those above grade, as well as for stripping the overburden.

Cableways

For grade quarries cableways are not used extensively. The great reason for this is that the product of the quarry does not have to be raised and transported as in pit quarries, but only transported. Then, too, unless a moving cableway is used, the stone must first be transported from the ledge to a loading place under the ca-

bleway in order that it may be picked up. This means the use of vehicles or cars, so it is evident that the hauling can be continued at little cost without the use of cableway. It can also be seen that the cableway must transport the load and return the empty before a second load can be carried from the quarry, while with vehicle or cars one or a dozen loads can be carried to the crusher at the same time.

There are cases in which a cableway serves as an auxiliary or supplemental plant in developing a quarry until the ledge is worked enough to use cars, especially when new places are being opened up or the grade of the quarry is being changed or if the quarry is being developed from a one to a two-lift quarry.

General Features of Development

In developing a quarry it is always of importance to plan out the blasting, for many of the economic features of operation must depend upon the blowing down of the ledge. Eating into the ledge from one side is always the cheapest but it keeps the forces spread out over a large area. An alternate method is to cut a channel into the ledge just as a railroad cut is made through a hill, thus giving the side of the ledge to work upon as well as the two excavated faces. The objection to it is the excessive cost of explosives in making the thorough cut, as the blasting must be done aganist three solid sides. With the channel once blasted out the cost of blasting is reduced.

To overcome this first high cost of blasting a variation of this method is used. Here a large blast is placed in the center of the ledge and lighter charges in the sides, thus cutting out a large wedge and quickly eating into the ledge, concentrating the work and preventing the blasting from injuring the plant, the same as by the channel method.

Both of these methods are adapted to either the use of cars or vehicles, as are also the circular and rectangular quarries.

In blasting it is never advisable to locate holes at random, or shoot deep holes without cleaning up the toe of the ledge. If hard rock is left against the face, the charge of explosive is so bound in that it has not power to overcome the resistance of the vast weight of stone at the bottom, and with the power thus used up, the rock at the top of the ledge is not broken up well, but is thrown down in large boulders. If the ledge is first cleaned up, and then as deep holes as possible are drilled, the holes being properly spaced, economic blasts can be made. That is, the greatest tonnage possible will be loosened and broken up for the least amount of explosives.

A ledge is poorly developed by the putting off small blasts over the face of the ledge. The cost is bound to be high not only for the drilling, but likewise for the explosives. Deep holes spaced upon some system will prove more economical, yet too deep holes have their disadvantages.

The American River Sand and Gravel Company, organized for the purpose of taking sand and gravel from the American River, and engage in building streets and roads, has filed articles of incorporation. Sacramento, Calif., will be its headquarters. W. S. Hatch, J. H. Morris and L. T. Jacobs, all San Francisco men, are the directors, and the invested capital is $30,000.

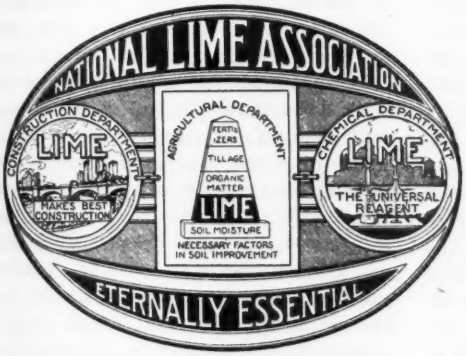
Mr. Geo. E. Zimmerman, who has been connected with the Chicago branch of the R. & J. Dick Company, Inc., 63 West Lake Street, as salesman since August, 1911, is leaving Chicago to take charge of the branch at Seattle, Wash. Incidentally, Mr. Zimmerman is getting married before he starts.

Insignia Adopted

Lime Association Thus Indicates Its Three Lines of Activity

THE National Lime Association has just adopted the insignia here shown. Regarding its adoption the Association bulletin says:

"This insignia will bear a good deal of study. It is more than a trademark or an emblem of the National Lime Association. It is built up out of the insignia of each of the three depart-



ments of the Association. These separate insignia will be used to identify each of our three departments. Their inclusion in the Association insignia will keep always before the public the three-fold uses of lime with which we are concerned.

"Credit for suggesting the slogan 'Eternally Essential' is due to Director George B. Wood, of Maine.

"The Association insignia will be used as a help in identifying our publications in the public mind. It may ultimately seem wise to use this insignia on the products of member companies as a mark of identification with the National Association and as a guarantee of quality."

The insignia will generally appear in blue in any printing in connection with the work of the association.

Keeping Trucks Fit

Inspection and Repairs Put on a Schedule Basis

ONE concern with ten motor trucks has reduced its force of repair mechanics from 5 to 2 by carefully scheduling the work and putting an inspection system in force. The number of trucks out of commission for repairs dropped from an average of 3 daily to a total of 7½ days for the entire fleet in six months.

As a part of the inspection plan, each driver was made responsible for his truck, but relieved of much of the care.

The driver's assistant was given the job of keeping the motor clean. A night man was hired to do the greasing, oiling and washing.

A schedule was worked out which leaves one truck in the shop each day for hall a day. In this way the ten trucks are inspected once a week. At this inspection the shop foreman and his assistant are able to go over the truck from end to end, make the necessary minor adjustments, and tighten up parts that happen to be loose.

The Rock-Cut Stone Company, Inc., of Syracuse, with also a plant at Auburn, New York, has secured an option on 300 acres of limestone quarry land in the vicinity of Oaks Corners, southeast of Phelps, New York.

The Empire Sand & Material Company, Wichita, Kan., has been incorporated with a capital of $40,000. S. M. Anderson, E. E. Everett, Daniel B. Cudworth, H. L. Everett and S. E. Anderson, the incorporators, are all Wichita men.

W. J. Beggs and J. J. Moore, Gadsden, Ala., are organizing a company to establish and operate a ganister rock plant in the vicinity of Rock Run,

Coal to Have Preference

Otherwise There Will Be No Discrimination, Says Washington

Our Washington correspondent was instructed to get the last-minute news about the car supply problem, and on the day of going to press this story arrived from him.

ALTHOUGH the commission on car service of the American Railroad Association, with headquarters in Washington, will do all in its power to keep the sand, gravel, stone and other building and road material interests adequately supplied with cars during the coming season, the fact is that these interests will receive only their pro-rata of cars along with other industries and then only after the coal industry has been amply supplied.

This means exactly one thing, as explained by A. G. Gutheim, member of the car service commission who has this specific matter in charge, and that is the sand, gravel and stone industries can expect no favors, but neither will they be discriminated against in favor of any other industry, unless it be the coal industry. At the same time, however, individual complaints will receive prompt attention and discrimination against any industry, or any individual in any industry, will not be permitted, it is made clear.

That, briefly, is the way the car situation stands. It is widely known that there is a shortage of freight cars and that the carriers are going to work under tremenduous difficulties to keep all industries satisfied. That task is looked upon in Washington as almost hopeless, for from all directions and from all industries complaints are being received of a shortage of cars, and the only thing left is to allocate the cars as equitably and as fairy as it is humanly possible. Each industry will receive what the car service commission considers its share and, as Mr. Gutheim expresses it, "no more and no less."

Dealing specifically with the question of supplying industries engaged in the production of road and other building materials, and indicating better than anything else the attitude of the commission toward the sand, gravel and stone industries, here is the latest order the commission has issued on the subject. It is addressed to the railroads:

"Information reaching the bureau of public roads of the United States Department of Agriculture, from various state highway commissions, and from producers of materials used in road construction, indicates that there will be an extraordinary heavy movement of these materials during the coming season. It is estimated that the road building this year will not be less than three times that of the heaviest previous season. The transportation demand will be accentuated by reason of the fact that much of the road construction will be in territory where stone, sand and gravel deposits are so located as to require abnormally long hauls.

"It seems to be apparent, from what has already been brought to our attention, that the handling of this business will require some co-operation between individual railroads and the commission on car service in order that maximum use of equipment and adequate service for this traffic may be secured. It is suggested, therefore, that individual carriers should, as promptly as possible, ascertain the demands that will be made upon them, and in the event that relief seems necessary the commission on car service should be promptly advised of all the facts so that the necessary steps may be taken looking to such readjustment

of car movement as is possible in individual cases."

The Interstate Commerce Commission is now organizing a car service section, but until that section is organized the distribution of cars will be in the hands of the car service commission of the American Railroad Association, which is and will continue to act under the direction of the Interstate Commerce Commission. Individual complaints, or even complaints of an industry as a whole, should be filed with the secretary of the Interstate Commerce Commission, and he has given assurance that they will be promptly adjusted.

It is the intention, as far as possible, to leave the distribution of cars to the individual railroads, especially as to the exchange of equipment between the roads, but the car service commission will prescribe the general rules under which the roads will operate, the commission at all times being directed by the Interstate Commerce Commission. It, therefore, would be advisable if producers establish and maintain close relationship with operating officials of the roads serving their plants. This would not necessarily assure them of any favoritism, but it probably would mean a little better and more satisfactory service.

Under the law returning the railroads to their owners, the Interstate Commerce Commission has absolute and unquestionable authority to distribute cars, and it will avail itself of the provisions of the law covering that subject. It will distribute the cars in the manner it judges best, giving preference only to those interests it considers deserving preference. In that connection a preference is already being given to the coal industry on the ground that it is a vitally essential industry and also that it is supplying essential industries.

In the order giving the coal industry preference, it is stated, among other things, that "the supply of cars available for the transportation of coal is insufficient to meet the demand," and that "critical situations still exist in which fuel for essential industries and purposes must be provided." The effect of this order is simply that the coal industry is being given a preference over all other industries and will continue to be given that preference until conditions change to such an extent that it is not considered necessary to maintain that preference

Visit by European Producers

European manufacturers are giving increased recognition to American industry as a vital factor in the world's work. What has been said about many other lines of industry is also true of the lime, stone and cement fields, one of the evidences of which is the recent visit to the United States of Mr. T. M. Ryan, of the Works Administration Department of the Buxton Lime Firms Company, Ltd., Buxton, Derbyshire, England. With one of his assistants, Mr. Marrison, he recently made a four weeks' tour among a number of the principal plants in the country. Mr. Chas. C. Kritzer, of The Kritzer Company, contracting engineers, whose offices are in Chicago, conducted the tour.

Mr. Ryan and his party made a thorough study of the above mentioned industries as they found conditions at the plants visited, and returned with considerable experience and data, which no doubt will result in the placing of large orders in this country for machinery for installation in the plants controlled by the Buxton Company, which owns thirty-five stone and lime plants and practically controls this line of business in England. The Kritzer Company has already closed contracts with them for three hydrating plants.

Word has just been received of the death of Mr. Jesse Allen, of the Jesse Allen Lime Company, of Burns, Tenn. He was almost eighty years old at the time of his death at Palm Beach.

New Men on Lime Staff

Two Educators Secured to Assist in Developing Promotional Work

PROF. JOHN H. SLIPHER of Purdue University has been appointed to the staff of the Agricultural Department of the National Association.

Professor Slipher is a graduate of Ohio State University of several years standing and has been in charge of the laboratory and advanced lecture instruction in soils in Purdue University at Lafayette, Indiana. In his teaching he has shown much originality in dealing with problems of soil improvement and investigation.

Professor Slipher will give attention particularly to field work and to relationships with the agricultural colleges, experiment stations and county agents. He will be available for lecture engagements. In addition he will assist in developing bulletins and in the preparation of material for the Agricultural Lime News Bulletin, the first issue of which will soon be ready for distribution.

In line with the enlarged program of activities now being undertaken by the Association, the services of Mr. R. H. Carter have been secured for the purpose of developing a comprehensive series of laboratory studies.

Mr. Carter has had a wide experience in teaching and research work and is eminently qualified for this branch of the work of the Chemical Department. He comes to this work from the Ordnance Department of the United States Army, where he has rendered valuable service in responsible positions during the past two years.

He will spend some time in reviewing conditions now prevailing regarding the various uses of lime, and laying plans for research programs of practical value.

Preventing Scale in Feed Water

Scale forming elements are contained in all feed waters. Some contain a large amount of solid matter in suspension—others again contain a great many scale forming elements in solution.

But whether in suspension or in solution, when they get into the boiler and are subject to the high boiler temperature, they quickly incrust the tubes and the boiler plates.

The result is waste of fuel, overheating, clogging of feed and blow-off pipes, etc.

Advice for preventing scale is the Buckeye skimmer, made by the Buckeye Boiler Skimmer Co., Water Works Drive, Toledo, Ohio.

It removes the impurities as fast as they are forced to the top in the course of the generation of steam, and discharges them into a precipitator or settling chamber.

Here the sediment is separated from the water and the water returned to the boiler, at a slightly reduced temperature, but absolutely pure.

The scale forming elements being removed in this way, scale cannot form in the tubes or on the plates, steaming capacity is increased, fuel bills cut considerably, and the life of the boiler doubled.

In boilers to which oily drips are returned, as from heating systems using exhaust steam, the trouble and annoyance due to the presence of grease or organic in the feed water are entirely overcome by the Buckeye floating skimmer.

The grease or oil that gets into the feed water is treated in the same way as all other impurities and foreign matters.

The Richmond Silica Sand Corporation, Box 977, Norfolk, Va., is planning for the development of over 100 acres of property in the vicinity of Mendota, Va. A complete plant will be installed at a cost of about $50,000, including machinery, and a capacity varying from 300 to 500 tons a day will be developed. It is proposed to inaugurate operations at an early date. Shields M. Bishop, Richmond, Va., is construction engineer for the company. Edward T. Scrutton is general manager.

Hendricks' Commercial Register

The 28th Annual Edition of Hendricks' Commercial Register of the United States for Buyers and Sellers for 1920 has just been published, after being delayed for two months by the strike of the printers in New York. It is published by the S. E. Hendricks Company of New York at $12.50. The new edition contains several improvements. The most noticeable being the new method of exterior indexing by coloring the front edge red, white and blue to indicate the different main sections of the book.

First is blue on which is stamped the words "Trades Index." This is a section of 162 pages in which every product listed in the book is indexed and cross indexed for ready reference. The red section is the main classified trades list. It contains 1,813 pages listing over 18,000 different products. In the present edition we find over 1,200 new headings including many headings completely covering the chemical industry. The third section of the book as indicated by the white edges contains 216 pages listing the trade names under which products are manufactured, with the name and address of the manufacturer. The second blue section is the alphabetical section of 487 pages containing all the names in the book in one alphabetical list with addresses, and their main line of business. This is followed by the index to advertisers of 20 pages, containing a full list of branch and foreign offices following each name. The whole book making a volume of 2,703 pages.

"Hendricks' Commercial Register" has been published annually by the S. E. Hendricks Co., Inc., exclusively for 28 years. The publication of this important reference book involving a tremendous amount of detail work in compilation and annual revision places before purchasing agents, sales managers a fund of valuable information not heretofore available.

The Grand Rapids Gravel Company, whose stockholders are William J. Breen, Nicholas Battjes, Henry N. Battjes and Dewey D. Battjes, all of Grand Rapids, Mich., has filed its articles of association. Capital stock is $100,000.

Detroit Office Opened

The Easton Car & Construction Company, in order to give their customers in the Detroit district the service that their business demands, have opened a branch office in Room 400, Penobscot Building, Detroit, Mich., in charge of Mr. H. H. Siff, the district sales engineer, who is experienced in industrial railway matters and whose services are at the command of those interested. Through this new branch office industrial railway users may secure quick, accurate, and dependable engineering services and the solution of difficult problems in special equipment. The Easton company announces that their branch office will carry a stock of spare parts as soon as the demand for such service makes it advisable.

Austin Company Increases Facilities

The F. C. Austin Machinery Co., Chicago, is incorporated to take over the entire business of the F. C. Austin Company, Inc., the Municipal Engineering & Contracting Company and the Muskegon plants of the Linderman Steel & Machine Co., and retains the personnel of the companies whose combined efforts are directed towards supplying the demand for the Austin machines.

F. C. Austin retires from the active management and the president of the Linderman Company, Mr. B. A. Linderman, assumes control.

Offices of the combination will continue in the Railway Exchange Building, Chicago.

New Publications

Portable Belt Conveyors for handling material horizontally or at a slight incline are described and illustrated in a new folder entitled "Type B Portable Belt Conveyors." This folder, just published by the Portable Machinery Co. of Passaic, N. J., contains prices of these machines which are made with 16-inch wide belt and in standard stock sizes.

These machines, in addition to being used for handling coal, sand, crushed stone, fertilizer, etc., are being used for conveying many manufactured products, bagged material such as cement, etc.

"Never Had a Steam Head Break"

This statement is made in a circular recently sent out by the Wood Drill Works, Paterson, N. J., regarding Wood rock drills.

This record covers a period of eighteen years, and enables the company to absolutely guarantee the steam head against breakage from any cause.

On the "Wood" drill the steam head body is made of semi-steel and held by four steel bolts with Columbia lock nuts. One side of head is threaded and on the outside the lock nuts are screwed tight; these bolts have electric welded heads of nut size. The bronze sleeve is the bearing, and is held by two steel bolts, the heads held in a recess. The packing acts as a buffer for the sleeve, and the nut locks, with the grooved nuts, prevent the nuts from unscrewing and falling into the hole and wedging the steel fast. A new sleeve can be put in place in a few minutes as no wear comes on the head itself.

Change in Chicago Office

The Quaker City Rubber Co. announces a change in the management of the Chicago office at 182 W. Lake Street.

Mr. Wm. S. Bloomer has been appointed Chicago district manager of this company, effective March 8th. In view of the fact that Mr. Bloomer was for many years connected with the rubber industry, located in Chicago, and has a wide following of friends in the central states, which extends to the Pacific coast and Alaska, the entire trade and his acquaintances will undoubtedly be interested in this announcement.

For the past ten years Mr. Bloomer has filled various important positions on the Pacific coast and in the large mining field of the West. He at one time made a special trip for one of the large corporations, visiting all of Alaska, which required an entire summer season trip.

The W. H. Cloud Molding Sand Company, of Louisville, Ky., has organized. The capital stock is $5,000. Incorporators are W. H. Cloud, L. M. Cloud and W. R. Neill.

Chemical Dictionary

A valuable hand book for anyone who is interested in chemical subjects is the "Condensed Chemical Dictionary," recently published by the Chemical Catalogue Company, Inc., 1 Madison Avenue, New York City. It was compiled under the direction of F. M. Turner, Jr., as technical editor.

The purpose of the book is to furnish a ready reference on all chemical substances for people who are not advanced scientists, but who desire to find out quickly what certain substances are, their properties, where they come from, the grades in which they are produced commercially, how they are shipped, etc. This information is given about each substance in the fewest possible words, but with plenty of margin on each page for the addition of notes where one desires to go into any particular subject farther. The book is sold at the price of $5.00.

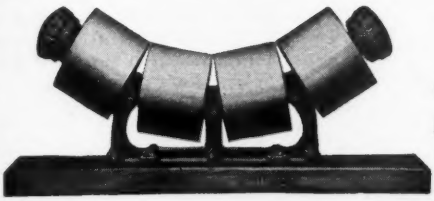
New Branch Store

A new branch store, assembling shops and sales offices of the Stephens-Adamson Mfg. Company, Inc., are located at 412-414 East Third Street, Los Angeles, Cal. Large stocks of standard S-A equipment and supplies are carried ready for quick delivery. The Los Angeles district engineering department will be maintained to assist customers and prospective customers in the design of elevating, conveying and screening machinery. Engineers thoroughly competent and experienced, who have an intimate knowledge of S-A machinery and its many adaptations, will be available for consultation. This branch will be under the direction of Mr. R. C. Pierce, Los Angeles district manager. The main office and works are at Aurora, Ill.

The Umpqua Gravel Company, whose headquarters will be at Marshfield, Ore., has been incorporated with a capitalization of $40,000. The incorporators are M. W. Payne, Isaac Tower and A. K. Peck.

Preliminary certificate of dissolution has been filed by the Kentucky Crushed Stone Company, Evansville, Ind.

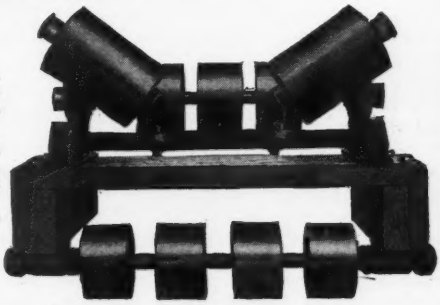
CALDWELL CONVEYORS

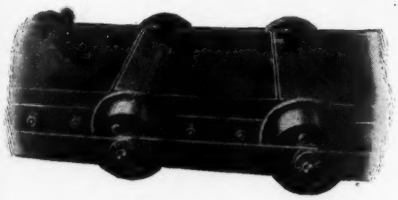


BELT CONVEYORS

Simple in design, economical of power, they give satisfaction. Different styles to suit your requirements.

A rough sketch showing conditions to be met at your plant, with capacity desired and power available, will bring our recommendations.





APRON OR PAN CONVEYORS

Flights or pans made of steel or cast iron, fitted to steel bushed self-oiling roller chain — complete with drives.

SCREW CONVEYORS

Steel "HELICOID" or Sectional flight screw conveyor for washing plants. We also make cast iron Screw Conveyors.

See Catalogue No. 38 for complete line of

Elevating, Conveying and Power Transmitting Machinery

H. W. CALDWELL & SON COMPANY
CHICAGO
Western Avenue, 17th and 18th Streets

Method of Belt Joining Helps Cement Mill

An unusual problem in the handling of hot cement clinker with a temperature of 200° and over, was recently solved at the plant of the Standard Portland Cement Company, Leeds, Ala., in an interesting and cost-reducing manner.

The method decided upon for moving the clinker was a rubber conveyor belt, but the clinker could not be cooled sufficiently in the process previous to conveying to prevent scorching of the belt and its rapid destruction. The answer to this problem was found by running the belt at an incline of 12°, so that the lower pulley dipped into a trough of water, thus carrying a film of cold water upon the belt, onto which the hot clinker from the loading hopper was deposited.

At this point a new problem was encountered, namely, how to join the belt so that the belt's full strength would be retained, and in a way which would withstand the extremes of temperature, the wear on the pulleys and the abrasion of the clinker. For this purpose Crescent belt fasteners were adopted, because they brought the belt ends tightly together in a snug joint, which made the belt practically endless on the pulley side, so there was no opportunity for clinker ash to get into the joint and abrade the belt ends, and also because in this method of joining, no metal came in contact with the pulleys to cause wear, and a permanent joint was thus assured. Moreover, the exceptional strength of the heads of the Crescent rivets and the formation of Crescent plates prevented destruction of belt joint through abrasion by the clinker.

In six months of operation, this conveyor has carried 61,000 tons of clinker, and the Standard Portland Cement Company credits the saving of $300 in belt cost alone to this conveyor.

The belt used was Goodyear Hytemp, which is made particularly to withstand temperatures up to 200°.

Not alone on heavy drives, such as tube mill drives, Griffin mills, crushers and heavy conveyors, are Crescent belt fasteners successfully used, but also on lighter drives of all kinds where dependability is an economic factor, as they assure continuous production.

As many readers of PIT AND QUARRY may have equally perplexing drives for which the fastening plays an important part for continuous service, the Crescent Belt Fastener Company have just published a new hand book illustrating Crescent belt fasteners in use on many different kinds of belting and under different conditions, and giving full data regarding their use. It will be gladly sent to any reader upon request to the Quarry Products Service Department, Crescent Belt Fastener Company, 381 Fourth Ave., New York.

New Jeffrey Office

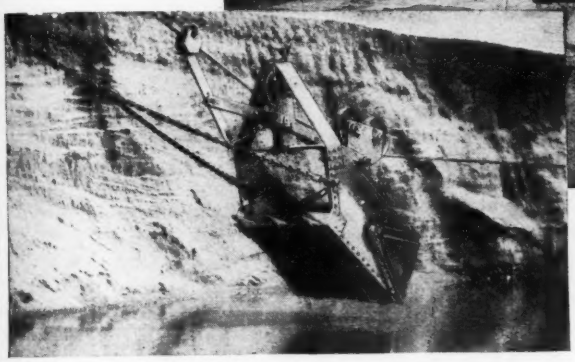
The Jeffrey Manufacturing Co., Columbus, Ohio, announces that in order to look after its rapidly growing business in California, Arizona, Nevada and the State of Sonora, Mexico, the company has opened a new branch office in Los Angeles, California.

This office will be in charge of Mr. F. R. Field, who has been manager of the Denver office. Mr. Field is well and favorably known in this territory, and his many years of successful salesmanship and a thorough personal knowledge of the west and the requirements of its buyers, especially fit him to take care of the constantly increasing demand for Jeffrey products in his vicinity, and render valuable assistance to clients in solving their elevating, conveying, crushing and mining machinery problems.

The position of secretary of the National Lime Association made vacant by the resignation of Mr. Norman G. Hough, has been temporarily filled by the Organization Committee by a rearrangement of the duties of that position under the general direction of Mr. E. O. Fippin as acting secretary until such time as the Board of Directors may reach a further decision for the continuance of this work.

With a capital stock of $100,000 the Parkersburg Sand Company, of Parkersburg, W. Va., has applied for charter to operate a sand plant at that place. C. D. Forrer, John Marshall, M. E. Hiehle, F. C. O'Connor and J. W. Romine, all of Parkersburg, are the incorporators.

Empty Bucket Running Down



Loaded Bucket Coming Up.

Link-Belt Cable Way Excavators

THE Improved Link-Belt Drag Line Excavator is a shovel, conveyor and elevator combined—controlled and operated by one man.

It digs as readily from below water as in the dry, and is especially adapted to sand and gravel plants.

We furnish complete outfits including mast fittings, blocks and cables. Send for our catalog.

LINK-BELT COMPANY

Philadelphia, Hunting Park Ave. and P. & R. Ry.
Chicago, 329 W. 39th St.
Offices in all principal cities

LINK-BELT

Sand and Gravel Plants

Geared Locomotive in Quarry Service

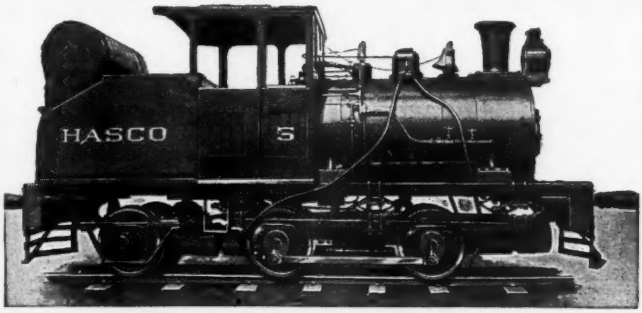
In any quarry operation or similar service, transportation is undoubtedly one of the most important elements and is vital for the efficient operation of the entire plant. Upon the efficiency, dependability and maintenance of the transportation system hangs the question of whether the entire operation will make a profit to its owner or be a financial loss. The back bone of the transportation system is the motive power, hence the importance of selecting the type of locomotive which is best suited to the particular kind of service involved. Locomotives are required which will handle the loads in the most efficient way, which can be depended upon to stay in service the maximum number of days per year, and which can be maintained at a minimum cost for repairs and replacements.

It is not generally advisable to expend any large amount of money to provide permanent road bed for this class of work and consequently the track is a temporary construction, more or less uneven and oftentimes with short curves and wide tie spacing. One of the fundamental considerations therefore is to select a locomotive which will operate satisfactorily upon this character of track with a minimum expense of maintenance both to the track and the engine. Moreover, in many plants there are very sharp grades upon which the locomotive is required to operate the loads. Oftentimes it is necessary to start loads on these grades and spot cars quickly and accurately at the crusher, dump or weighing machine. This condition of operation requires an engine which can start cars quickly, operate on rough and uneven track, pull up sharp grades and take sharp curves.

The accompanying illustration shows the Shay geared locomotive, built by the Lima Locomotive Works. These engines are especially adapted to quarry service and they meet the requirements outlined above. It has been repeatedly demonstrated that this type engine can be depended upon to increase the output of a quarry. It is the minute saved in starting cars and spotting them accurately for loading and unloading which largely determines the efficiency of the operation.

It will be noted that the total weight of the locomotive is carried on the driving wheels, of which there are four pairs, spaced far enough apart to distribute the weight of the locomotive over a long length of track. However, the rigid wheel base of each truck is short, which allows the engine to operate on very sharp curves. The locomotive is supported on two driving trucks, each having a center plate, which permits the truck to turn freely. The frame is stabilized by side bearings so arranged as to permit easy curving and give flexibility. The geared drive gives a very even tractive force at the rim of the driving wheels. This is why the Shay locomotive starts promptly without slipping.

The boilers are arranged to burn either coal, wood or oil and are designed with ample steaming capacity. The small sizes of engines are built for any gauge from 18 inches up. The larger sizes can be built for 36-inch gauge and up. The engines are easily operated, so that an engineer who can operate a traction engine will quickly learn to run one of the Shay's with very little instruction. All material used in the construction of these locomotives is in accordance with the specifications of the American Society for Testing Materials and the boilers are built to pass the requirements of the latest boiler codes.



We Can Solve Your Locomotive Problem for You—

with one of our various types of

BELL LOCOMOTIVES

(Steam—Oil Burning—Geared Type)

Some of the features of our equipment follow:

Built in sizes of 3 to 20 tons' capacity and for gauges of 18 inches or over.

Light in weight and easily transported from place to place, but powerful in tractive effect.

Burns kerosene, fuel oil, distillate or any other freely flowing oil, without change of burner.

Flexible frame construction and low center of gravity permit speed over rough and uneven track and roadbed.

Ruggedly built, with parts readily accessible and interchangeable.

Full details on request.

Bell Locomotive Works, Inc.

23 Water Street NEW YORK

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trademark attorney, Continental Trust Building, Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering.

1,330,825. Rock-cutting apparatus. Robert Temple, Denver, Colo., assignor to Imperial Tunneling Machine Co.

1,330,826. Excavating scoop. Frank M. Turner, Omaha, Neb.

1,330,977. Dump-car. William L. Burner, Columbus, Ohio, assignor to Kilbourne & Jacobs Mfg. Co., same place.

1,330,978. Dump-car. William L. Burner, Columbus, Ohio, assignor to Kilbourne & Jacobs Mfg. Co., same place.

1,331,020. Conveyor. Joseph A. MacLennan, Philadelphia, Pa., assignor to Link-Belt Co., Chicago, Ill.

1,331,455. Grab-bucket. Arthur F. Case, Cleveland, Ohio, assignor to Wellman-Seaver-Morgan Co., same place.

1,331,464. Apparatus for conveying and delivering materials. Francis L. Stuart, New York, N. Y.

1,331,484. Method and apparatus for cleaning conveyor-belts. Edward G. Carr, Milwaukee, Wis., assignor to Lakewood Engineering Co., Cleveland, Ohio.

1,331,622. Tripping device for cableway buckets. Frederick C. Carstarphen, Trenton, N. J., assignor to American Steel & Wire Co.

1,331,780. System of hoist control. Ray C. Newhouse, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis.

1,331,963. Portable crusher. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Mfg. Co., same place.

1,331,964. Grinding mill and tumbling comminuting body therefor. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Mfg. Co., same place.

1,332,662. Excavating and loading machine. William M. Gross, Las Vegas, Nev.

1,332,685. Method of and apparatus for screening materials. Mobley P. Reynolds, Cleveland Heights, Ohio, assignor to W. S. Taylor Co., Cleveland, Ohio.

1,332,689. Method of removing stratified rock. Holher Rommerdale, Erie, Pa.

1,332,745. Coal-cutting chain. Frank J. Oakes, Indianapolis, Ind., assignor to Link-Belt Co., Chicago, Ill.

1,332,814. Apparatus for washing coal and the like. George R. Delamater, Haddon Heights, N. J., assignor to Pennsylvania Crusher Co., Philadelphia, Pa.

1,332,938. Mixing apparatus. Howard L. Wadsworth, Cleveland, Ohio, assignor to Sand Mixing Machinery Co., New York, N. Y.

1,332,929. Sand cutting and screening mechanism. Howard L. Wadsworth, Cleveland, Ohio, assignor to Sand Mixing Machinery Co., New York, N. Y.

1,332,986. Method and apparatus for conducting mining operations. Carl W. Jensen, Winifred, Mont.

1,333,006. Conveying apparatus. George B. Welser, Jr., Milwaukee, Wis., assignor to Cahin Belt Co., same place.

1,333,165. Loading apparatus. John T. Fetherston, New York, N. Y.

1,333,219. Screening apparatus. Morley P. Reynolds, Cleveland, Ohio, assignor to W. S. Tyler Co., same place.

1,333,220. Screen. Morley P. Reynolds, Cleveland, Ohio, assignor to W. S. Tyler Co., same place.

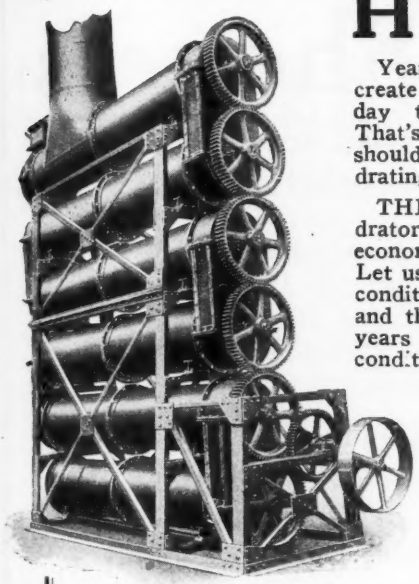
1,333,293. Tilting side-dump car. Charles H. Clark, Dormont, and Howard L. Beach, Edgewood, Pa.

1,333,320. Brake mechanism for mining cars. Frank Krashowetz, Eddyville, Iowa.

1,333,491. Tunneling machine. Howard R. Hughes, Houston, Tex.

A new industry has been organized under the name of Scottsville Sand and Silica Company, Scottsville, Va., to manufacture and deal in building material, the invested capital being $25,000. The officers: John S. Martin, president, and G. T. Goodwin, secretary, are both Scottsville men.

A new $60,000 corporation to be known as the Tractor City Sand & Gravel Company, Janesville, Wis., has been incorporated by O. G. Olsen, Fred H. Howe and H. S. Thometz, all of Janesville, and C. H. Kimball, Milwaukee.



"THE KRITZER WAY"

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

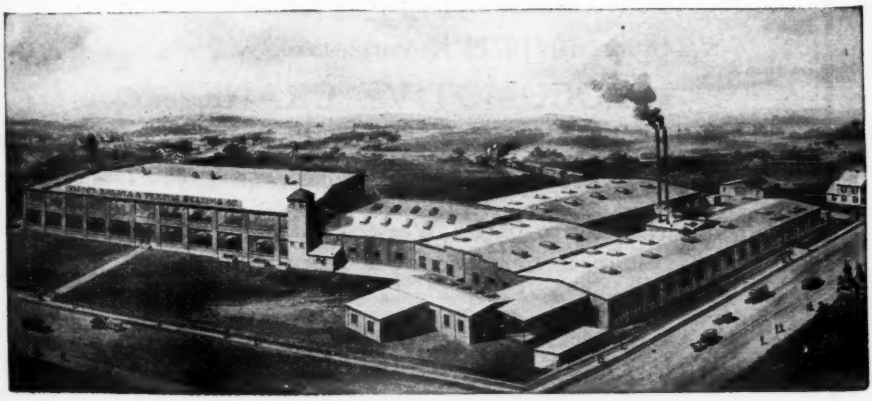
THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions will give you the best product at lowest cost.

The Kritzer Company

503 S. Jefferson St.

Chicago, Ill.



Factory Behind the Product
Belting for Driving and Conveying

"V-B" (Victor Balata)

"Ampere" Canvas Stitched

"Keystone" Impregnated Solid Woven

Victor Balata & Textile Belting Co.

Main Sales Office: 38 Murray St., New York City

Boston	Cincinnati	Chicago	Factories
87 High St.	212 E. 2nd St.	167 N. Market St.	Easton, Pa.

Steam Shovels

Special attention is called to the following thoroughly overhauled shovels.

1—Model 0 Thew, shop number 1084.

2—Marion 60 Steam Shovels with 2½ yard dipper, Shop Nos. 1995 and 2059.

1—Model 70 Marion, 2½ yard dipper, shop number 2693.

LOCOMOTIVES

1—Fate 3-ton Gasoline Locomotive.

1—60 ton, 18x24, six wheel Switching Locomotive, standard gauge, 150-lb. pressure, INTERSTATE Certificate.

1—36 ton, 14x20, H. K. Porter Saddle Tank Locomotive, standard gauge.

6—18 ton, 10x16, H. K. Porter Dinkeys, 36″ gauge.

LOCOMOTIVE CRANE

1—60-ton Industrial, 8-wheel, 85 ft. boom.

CARS

30—12 yard capacity Western, standard gauge air dump cars, 26′ beds.

CABLEWAY

1—3 ton capacity Lidgerwood Cableway 1164′ span, complete with Lidgerwood 9x10 Cableway engine.

In addition to the above, we have a large stock of contractors' construction equipment of various classes.

H. Kleinhans Company Union Arcade, Pittsburgh, Pa.

EFFICIENCY

RELIABILITY

READING

CO-OPERATION

Your Inquiries Solicited

SERVICE

Estimates Given Cheerfully

New — Used — Rebuilt
Machinery and Supplies
FOR
Construction and Industrial Work

Galvanized Guys

40,000 ft. of 7/8" 6x7, steel yacht or derrick guys, 100' to 300' lengths.

Derricks

3—Guy derricks, 80' masts, 75/79' booms, Oregon Fir, 16" A. H. & D. Co. fittings, all blocks and steel bullwheels.
1—Stiff Leg derrick, mast 20"x20"x30', boom 16"x16"x65', sills and legs, complete with blocks and bull wheel.

Derrick Car

Capacity, 15 tons, all steel car body, standard gauge, 8-wheel trucks.
M. C. B. equipped, 30/35' boom, "A" frame mast, bull wheel, 8¼x10 D. C. D. D.
J. S. Mundy hoisting engine with boiler and swinging gear attached.

Buckets

40—2 cu. yd. Steubner, "Excelsior" bottom dump.
1—1½ cu. yd. Brown Hoist, clam shell, ore-bowl.
2—1¼ cu. yd. Hayward, multi-power, orange peels.
1—1 cu. yd. Hayward, multi-power, orange peels.
2—1 cu. yd. Hayward, Class "E," clam shells.
1— ¾ cu. yd. Hayward, Class "E," clam shells.

Rock Drills

6—Ingersoll-Rand, C-24, cyl. 2¾" with tripods, weights, throttle and oilers.
9—Ingersoll-Rand, F-32, cyl. 3⅝" with tripods, weights, throttle and oilers.
15—Oldham Plug drills.
2—Sullivan "U45" quarry bars with 2 saddles each.
20—Ingersoll-Rand, BC-23 hammer drills.
16—Ingersoll-Rand 5F electric pulsator tripod drills, with 5 H. P. A. C. motors.
4—Ingersoll-Rand, Electric wagon drills, with 12 H. P. 3 ph. 60 cy. 220 v. motors.

Miscellaneous

1—30 H. P. Woodbury-Booth steam engine.
1—65 H. P. Russell automatic steam engine.
2—65 H. P. Westinghouse, Jr., steam engine.
1—No. 11 Cameron, steam pump, 16"x10"x18", 8" suct. 6" disc.
1—Morris Centrifugal pump, 8" suction, 6" disc, direct connected to 7x7 vertical engine.
1—Snow duplex pump, 10"x7"x10", 6" suction, 5" discharge.
15—New No. 3 American, 2-wheeled scrapers, at used prices.
60—Blasting machines, 20 to 50 hole.

See March issue of Pit and Quarry for Shovels, Locomotives, Well Drills, etc.

The above is a partial list of our plant, we also have a general line of equipment and probably what you need. Write us.

Reading Engineering Co., Inc.
Tribune Building **New York, N. Y.**

WANTED

Dinkey locomotives, 7, 9, 12, and 14 ton in the Davenport and Vulcan make. Will accept them in any condition that will justify our rebuilding and repairing same. Quote us your lowest cash price.

THE PITTSBURG BOILER & MACHINE COMPANY
Pittsburg, Kansas

WANTED

Quarry Enlarging Its Capacity Wants to Buy

1—Large jaw crusher, 1,000 to 2,000 tons in 10 hours.
2—No. 5 or No. 6 gyratory crushers.
2—¾-yd. or 1-yd. steam shovels.
1—Keystone excavator.
1—Blast hole well drill.
1—70-ft. elevator, 30 or 36 in. buckets.
1—60-in. screen, 26 to 30 ft. long.
1—Hammer mill pulverizer.
20 lb. rails.
2-ton to 3-ton dump cars.

Address Box 30, care Pit & Quarry, 538 S. Clark St., Chicago, Ill.

FOR SALE

Two large steel bins, hopper bottom. 450 ft. steel conveyor cashing for 16-in. screw conveyor, without lids.

One Special, 112 H. P., single-band, friction, electric hoist, complete. Almost new.

Address Box 21
PIT & QUARRY
538 S. Clark St. Chicago, Ill.

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are listed in our Catalog of 99% guaranteed Mailing Lists. It also contains vital suggestions how to advertise and sell profitably by mail. Counts and prices given on 9000 different national Lists, covering all classes; for instance, Farmers, Noodle Mfrs., Hardware Dlrs., Zinc Mines, etc. *This valuable reference book free.* Write for it.

Send Them Sales Letters

You can produce sales or inquiries with personal letters. Many concerns all over U. S. are profitably using Sales Letters we write. Send for *free* instructive booklet, "*Value of Sales Letters.*"

Ross-Gould Mailing Lists St. Louis

WANTED

Man experienced and capable operating small sand dredging plant and installing modern equipment. Permanent position; good pay; pleasant and healthy surroundings. Plant located within city. B. B. TAYLOR, Macon, Ga.

WANTED

A Bucyrus or Marion revolving traction shovel, that can handle a yard and quarter to yard and half dipper in stone. Address, **Box 31,** Pit & Quarry, 538 S. Clark St., Chicago, Ill.

FOR SALE

One revolving screen made by Webster Mfg. Co. Length between bearings, 17 ft. Gravel screens 4 ft. in diameter, sand screen 6 ft. in diameter. Good condition.

THE BEDFORD-NUGENT CO.
Evansville, Ind.

FOR SALE

1—Keystone Excavator, No. 3, two ditcher scoops, one dipper scoop and one skimmer scoop; like new; immediate shipment. Attractive price.

MOORE BROS.
39 S. LaSalle St., Chicago

FOR SALE

10-inch Belt-Driven Sand Pump. New Manganese Steel Runner. Installing bigger pump.

Broadway Sand, Gravel & Art Stone Co.
Stop 5, Bedford, Ohio

FOR SALE

Bucyrus Steam Shovel—Class 18B Traction Type—Serial No. 1821.

Security Cement & Lime Co.
Hagerstown, Md.

UNITED STATES SHIPPING BOARD
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Submit for Sale the following standard make

PNEUMATIC TOOLS

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355 Pneumatic Drills
174 Pneumatic Hammers
51 Pneumatic Rivet Busters
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47 Pneumatic Chipping Hammers
25 Close Quarters Thor Drills
28 Pneumatic Caulking Machines

Offers for entire lot will receive first consideration and be subject to quantity discounts.

Further particulars and permission to inspect same at their present storage points: Wilson's Point, Conn.; Soller's Point, Md.; Hog Island, Pa.; may be had on application to any of the following sales and sub-sales offices:

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Custom House, Boston, Mass.
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Northwestern Bank Bldg., Portland, Ore.
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United States Shipping Board Emergency Fleet Corporation

Supply and Sales Division — **Sixth and B Streets, Washington, D. C.**

FOR SALE OR RENT
CONTRACTORS EQUIPMENT

AIR COMPRESSORS

7—Chicago Pneumatic Tool Co. Class N—SGLTM 10½x7¼x10 in., with gas engine and air receiver mounted on trucks. Practically new.

DERRICKS

1—Stiff Leg, boom 16-in. x 16-in. x 80-ft., mast 16-in. x 16-in. x 50-ft., bucket operating, like new.
5—Stiff Leg Derricks, boom 14-in. x 14-in. x 60-ft., mast 12-in. x 12-in. x 32-ft., sills and legs in proportion, Terry & Tench fittings, 2 arranged for clam shell, 3 for single line.
1—Stiff Leg, 40-ft. boom, capacity 3 or 4 tons.
2—Breast Derricks.

HOISTS

1—10x12 D. C., D. D. Lidgerwood, with banked levers, no boiler.
3—9½x12 D. C. 3 drum with boiler, 2 Lamberts and one National with attached swinger.
10—8¼x10 D. C., D. D. with boiler, American, Lambers, Lidgerwoods, Flory, Clyde or Mundy.
15—7x10 D. C., D. D. with boiler, American, Lidgerwood, Lambert, O. & S., Mundy, Clyde and Flory.

STEAM SHOVELS

2—Type O Thew, fully revolving, ⅝ yd. dipper, traction wheels.

EXCAVATORS AND BACKFILLERS

3—Keystone Excavators, steam engine, boilers, complete with skimmer scoops.
1—Buckeye Wheel Type Trenching Machine, No. 4, with gasoline engine, on caterpillar traction.

BUCKETS

1—Brand new 2½-yd. Butler dragline bucket.
1—1-yd. Hayward orange peel.
Several others of various makes and sizes.

WAGON LOADERS

5—Jeffrey Portable gasoline driven traction bucket wagon loader, like new.

CARS

15—34-in. gauge Koppel V-shaped, 1-yd. side dump cars.
35—36-in. gauge, 4-yd. Western side dump cars.
12—12-yd. standard gauge, side dump.

DRAG LINE

1—Insley Drag Line, new, 60 ft. boom, with 1½ yd. drag bucket; with 9x13 National engine, with boiler, like new.

These are only a few items of the equipment we own. If you do not find what you want, write or wire us your requirements.

We are in the market for used equipment of all kinds. Write us, giving full description and price.

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MARSH'S
Quarry Specialties
GUARANTEED

BUCKETS

1—1 yd. Orange Peel	$ 300
1—1-yd. Dragline, Page	300
2—1-yd. Concrete at $50 each	100
1—1½-yd. McMyler (new)	500
3—2-yd. Brown Hoist at $500 each.	1,500

BOILERS

1—200 H.P. Scotch Marine	2,000
1— 30 H.P. Upright	200
1— 15 H.P. Upright	100
1— 60 H.P. Upright	800
1— 50 H.P. Upright	700
2— 60 H.P. Erie Economic at $750 each	1,500

CRUSHERS

1—No. 12 Gates Style K manganese fitted nickel steel shaft (almost new)	8,000
1—No. 7½ Austin Gyratory	2,500
2—20x24 Blake, each	2,000
1—No. 4 Gates Gyratory	1,000
1—10x20 Blake	750

COMPRESSORS

1—Rand Imperial Duplex, cap. 1,500 ft.	2,000
1—Ingersoll, 2-stage, air, belt drive, 600 ft.	1,000

DIPPER

1—2½-yd. Bucyrus	500
1—¾-yd. Browning with boom and engine (new)	750

DRILLS

8—Chicago Pneumatic Tool Co. 3¼ in. drills, each	100

DERRICKS

1—5-ton Stiff Leg with steel bull wheel	500
1—2-ton Stiff Leg	200

ENGINES

1—150 H.P. Atlas Automatic	$ 750
1—200 H.P. Allis-Chalmers Corliss.	1,250
1— 20 H.P. Erie Center Crank	200
1— 70 H.P. Erie Center Crank	300
1— 15 H.P. Keystone Reversible	250
1—Westinghouse	250
1—150 H.P. Stillwell Bierce	150

HOISTING ENGINES

2—6¼x10 American Hoist and Derrick with boiler at $750 each	1,500
2—6x8 Contractors' Plant Co. S. C. S. D., at $200 each	400
1—8x12 Lidgerwood D. C. D. D.	500
1—12x14 Special Dragline, 90 H.P. (new)	1,500
1—9x10 D. C., 3-drum Cableway Engine	1,500

LOCOMOTIVES

1—Vulcan 36-in. gauge Saddle Tank	1,000
1—Porter Standard Gauge Saddle Tank, 14 tons	2,000

PUMPS

1—No. 5 Pulsometer	100
1—Wilson-Snyder Water Works, 3,000,000 gals. per day	1,500

ROLLERS

1—10-ton Steam Roller	1,000

SCREENS

1—42-in. by 14-ft. Screen complete	400
2—Stephens & Adamson at $150 each	300

SHOVELS

1—Model 28 Marion Traction, fine	4,700
1—Vulcan-Bucyrus Revolving Shovel, standard gauge, perfect	3,250
1—70 C. Bucyrus with standard, also stripping booms and dippers	11,000

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MACHINERY—For Sale—DERRICKS

Road Roller—8-ton Wheeling tandem, A-1 shape; price $1,800.00.
Road Rollers—5 and 10-ton.
We have on hand 5 Road Paving Concrete Mixers, Koehring-Foote-Municipal

10 Barnes Force Pumps with Novo Gasoline Engines, 225-lb. pressure. Pumps 1,500 gallons per hour through 20,000 feet of 2-inch pipe, 3"x5" and 4"x5".

STEAM BOILERS

50 H.P. vertical boiler.
125 H.P. firebox boiler, Butt Strap.
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7x10 Lidgerwood D. C. swinging or car pulling hoisting engine.
7x10 double drum double cylinder hoisting engine.
6¼x8 double drum, double cylinder hoisting engine.
8¼x10 three drum, double cylinder hoisting engine.
Clam Shell Buckets, ½, ¾ and 1 yard.
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Vulcan Pile Hammers, Steam and Drop.
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Wire Rope Sheaves, Blocks and Bronze Bushings for Sheaves.

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Lot of 15-in. steel elevator buckets.
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1 No. 4 style K Gates crusher.
1 No. 6 Gates elevator.

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2—30 ton, 18 in. new three sheave special heavy Boston & Lockport wire rope blocks with shackles.

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1—1300 cu. ft Ingersoll-Sargent belted with 200 H.P. 3 ph. 60 cycle, 2200 volt motor.
1—2400 cu. ft. Ingersoll-Rand two stage air cross compound with Corliss valves.

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1—No. 7½ Style "K" Gates Gyratory.
1—No. 21 Style "K" Gates Gyratory.
1—60x84 P. & M. Superior Jaw.

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1—60 H.P. d. d. & Swinger Lambert Electric.

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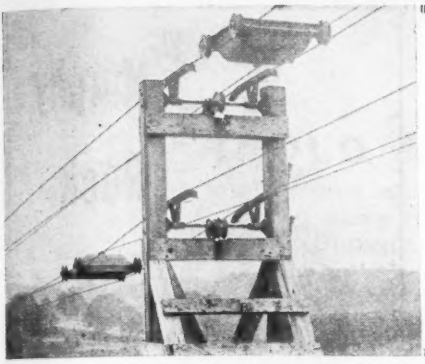

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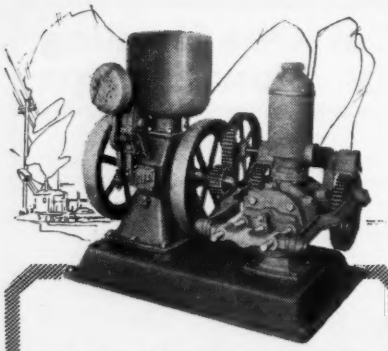

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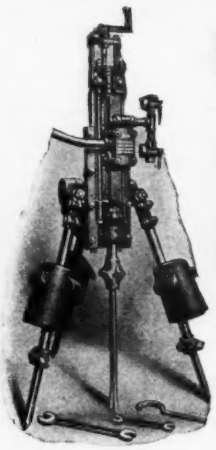

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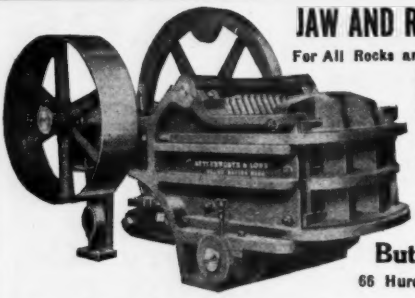

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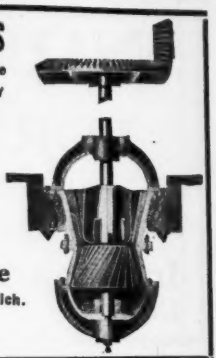

Butterworth & Lowe

66 Huron Ave., Grand Rapids, Mich.

Nippers—17x19", 18x26" 20x30", 24x36" and 26x42".

Rotaries—20" to 47" inside diameter. Many variations.

STOP PICKING; PICK THE "ADEN"

"ADEN"

HEAVY SERVICE

Grab Buckets

MANUFACTURED BY

The Advance Engineering Co.

Office and Works, 6539-41 Metta Ave.

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Union Steel Rivetless Chains

"The Chain of Double Life"
Fits Cut and Std. C. I. Sprockets
1 to 12 in. pitch.

High Carbon Links (STRENGTH) Large Glass—Hard, Reversible Bearings (DURABILITY), One-Piece Rivetless Construction (PERMANENCY) insure Trouble-Proof Money Saving Service. Bushing Chains, Roller Chains, Attachment Links, Buckets, Sprockets, Elevators, Conveyors, etc.

THE UNION CHAIN & MFG. CO. Seville, Ohio.

Negley Excavator

One-man control. Operated upon Slack Cableway. One line does loading and dumping. Will discharge at either end of track line.

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Indianapolis Cable Excavator Co.

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TOWER DRYER

FOR

Sand, Gravel and Cement Plants

INSTALLATION, OPERATING and REPAIR COSTS CUT IN HALF

"FARREL" STYLE "B" CRUSHERS

Complete Crushing, Screening and Washing Plants for Sand and Gravel Bulletin C-2

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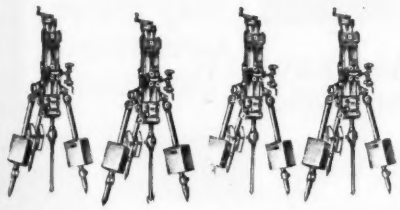

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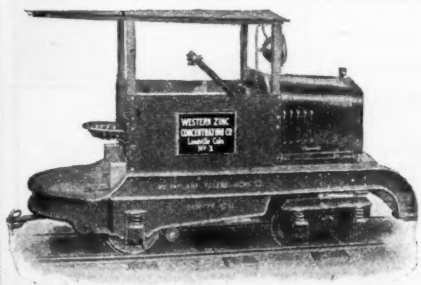
ROCK DRILLS

and

Hammer Drills

all sizes and for all purposes.



A Gasoline Locomotive

with a

Ford Engine Power Plant

adapted for very short curves

18 in. to 36 in. Gauge

300-lb.-600-lb. Draw-bar Pull

Practical : : Economical

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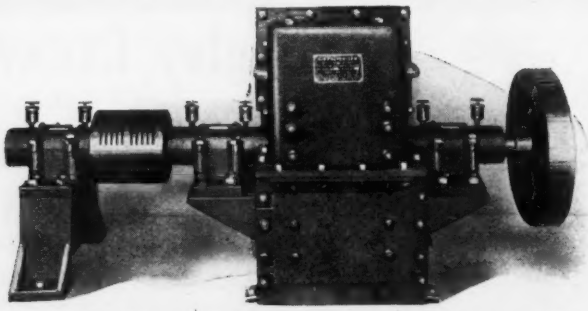

Put Your Crushing Problems Up to a

K-B PULVERIZER

Gives best service, lasts longer, uses less power and has many improved features. Built ALL-STEEL.

Send for Catalog with Figures on What You Want to Crush

K-B Pulverizer Company, Inc.
92 Lafayette Street, New York

K-B PULVERIZER

They make good Belts give better SERVICE

They save time, labor & Belting

They insure Continuous Production

They do not cut out, punch, tear or injure the belt

They insure full power Transmission

They sustain the belt's full strength

CRESCENT BELT FASTENERS

"Make Good Belts Give Better Service."

CRESCENT BELT FASTENER COMPANY 381 FOURTH AVENUE NEW YORK
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Detonating Fuse

should be used to detonate the explosive charge wherever the well drill method of blasting is used.

Cordeau is safe. It is practically instantaneous. It is economical. It adds from 10 per cent to 20 per cent to the efficiency of the explosive.

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The Ensign-Bickford Company

Original Manufacturers of Safety Fuse

Established 1836

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PIT *and* QUARRY

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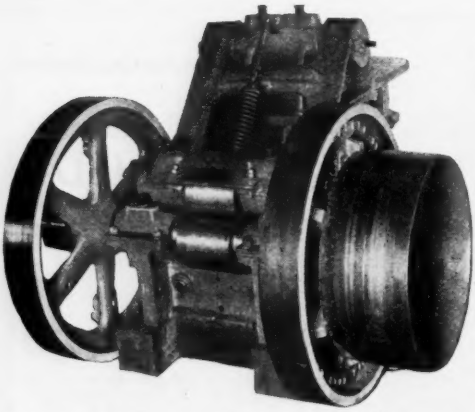

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The Crusher with the Longer Life.

All **RELIANCE** Equipment is built to meet the hardest conditions and to operate at an extremely low maintenance cost.

We manufacture a complete line of

QUARRY AND ROAD-BUILDING EQUIPMENT

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Prompt Deliveries

Universal Road Machinery Co.

Kingston, N. Y.

Canadian Representatives F. H. HOPKINS & CO., Montreal and Toronto

They produced Limestone at 10 to 15 Cents a Ton and

Then They Bought THREE MORE

American Ring Pulverizers

There is a demand for limestone and furnishing this product can prove an added source of profit in quarrying. Our pulverizer with its rolling ring action is highly efficient, and low in power consumption and in upkeep.

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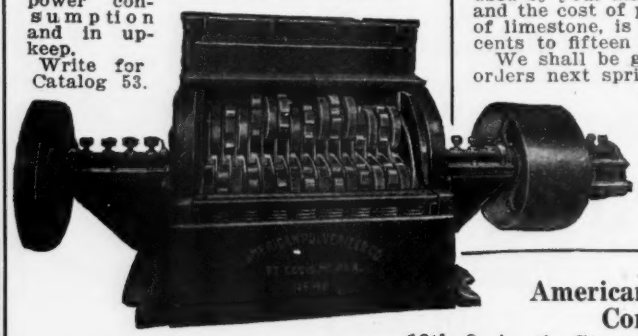


Here's What They Say:

Gentlemen:—

After investigating different pulverizer constructions, we were advised by good authorities to purchase one of the American Pulverizers, especially suited for grinding limestone. Up to now we have ground over ten thousand (10,000) tons of limestone in the last three (3) months, with your machine No. 36 and we can say that the amount of power used by your machine, is very low and the cost of production per ton of limestone, is running from ten cents to fifteen cents per ton.

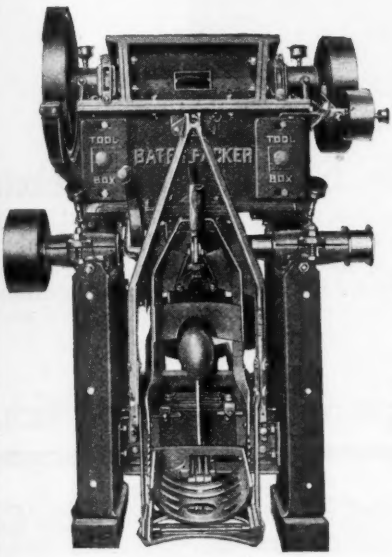
We shall be glad to double our orders next spring.

Yours very truly,
COLUMBIA QUARRY COMPANY,
C. P. Tigges,
Secretary.
St. Louis, Mo.

American Pulverizer Company

18th & Austin Sts., St. Louis, Mo.

BATES BAG FILLING MACHINE



Less Labor
Greater Output
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Used universally for packing pulverized rock products.

Bates Valve Bag Company
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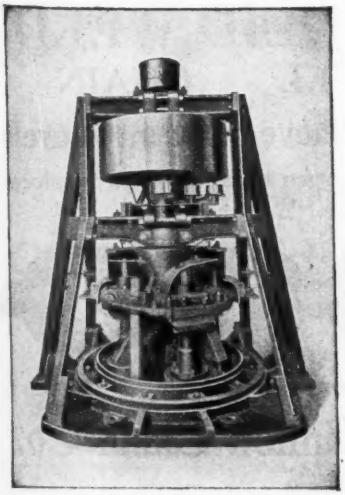

The Perfect Agricultural Limestone Pulverizer

THE BRADLEY 3 ROLL MILL

Produces a very fine, uniformly-ground product at minimum cost. A mill built to meet the demands of the most exacting trade.

Produces a fine-ground product cheaper than most other machines when producing coarse materials.

Finishes in Single Operation

We are prepared to furnish complete plans for agricultural limestone plants.

Catalog 42 Upon Request

BRADLEY PULVERIZER CO.

BOSTON LONDON Works: ALLENTOWN, PA.

Howe Charcoal Malleable Iron Elevator Buckets

Castings of the highest quality, uniform throughout, with clean, straight edges. Reinforced at corners to add to strength and durability. All Howe buckets are 90% Charcoal Malleable Iron—not the usual coke iron. The greater strength and durability of Charcoal Malleable Iron buckets and their ability to resist corrosion, rust and wear are well known to all users.

Write for Catalog 100.

Howe Chain Company, Muskegon, Mich.

Howe Chains-Buckets

"HERCULES SOLID WELD"

STEAM SHOVEL CHAIN

The Chain That Puts the Shove in Steam Shovels

In use for many years. Will not open at weld or go to pieces before it actually wears out.

Manufactured only by:

The Columbus McKinnon Chain Co.

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The Longest Lived Steam Shovel Chain Ever Produced

TAYLOR MESABA

Cuts down expenses,
Eliminates waste time,
Increases your yardage

S. G. TAYLOR CHAIN COMPANY

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Conveyor, Loading, Steam Shovel, Dredge, Crane, Quarry and Hoisting Chain

"As Good as the Name"

UNITED STATES CHAIN & FORGING COMPANY

Union Arcade Pittsburgh, Pa.

US

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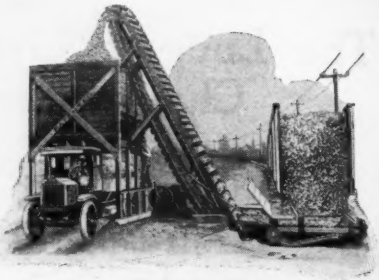
When equipped with proper size feeder, the SUNBURY Automatic Unloader

Will load or unload a 50-ton car in 90 minutes!



The SUNBURY Automatic Unloader

And one man can handle it. The first cost is reasonable and its return from the standpoint of its being able to substantially increase your profits makes it a very profitable investment.

Its automatic feature is important and will commend it to you. It is simple in construction, strongly built and economical in operation.

We will be pleased to send you an illustrated descriptive circular.

THE SUNBURY MANUFACTURING CO.

SUNBURY, OHIO

The SCOOP CONVEYOR
FOR STORING AND RECLAIMING, LOADING, AND UNLOADING CARS, TRUCKS, AND WAGONS
Does the Work of from 6 to 12 Men
and
Keeps Equipment Moving
Saves Car Demurrage
PORTABLE MACHINERY CO. PASSAIC, N.J.
OVER 2000 USERS

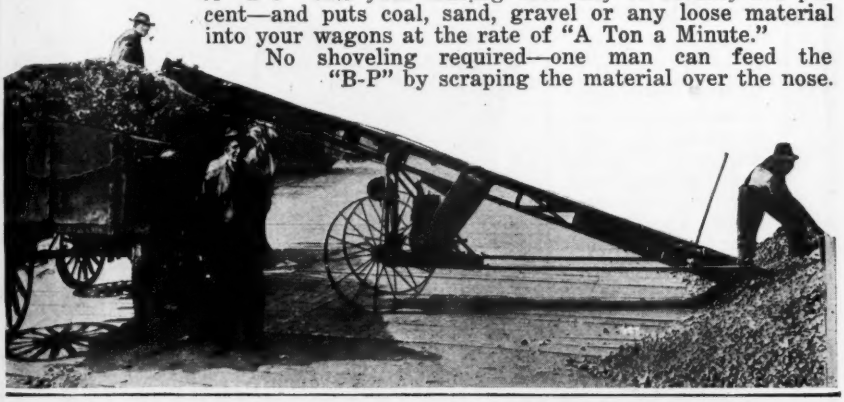
One Man Loading!

Bulletin D-204 is yours for the asking—no obligation.

One man and a "Brown-Portable" Belt Conveyor can load your wagons in one-half the time four to six men can do it with shovels.

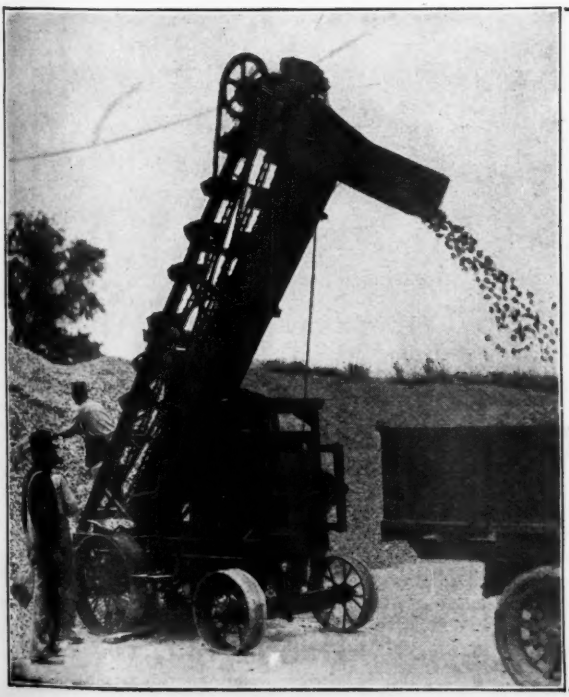
A "B-P" cuts your loading cost fifty to seventy-five per cent—and puts coal, sand, gravel or any loose material into your wagons at the rate of "A Ton a Minute."

No shoveling required—one man can feed the "B-P" by scraping the material over the nose.



Brown Portable Conveying Machinery Co.

10 S. La Salle St., Chicago **30 Church St., New York City**



ATLAS
Self-Propelling
LOADERS

Loading the Atlas Way, spells economy and efficiency in handling sand, crushed stone or gravel.

Let an Atlas Loader be one of the means to help solve your labor problems. Loaders built for handling coal and other loose material.

Write us what your wants are and let us tell you how you can handle your material cheaper and better. Write for

Atlas Loader Catalogue.

Atlas Engineering Co.

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INSLEY QUARRY CARS

INSLEY

INSLEY CARS FOR QUARRY WORK are designed and constructed to the end that operating and maintenance costs may be reduced to a minimum. They merit your investigation.

Let us figure on your car requirements.

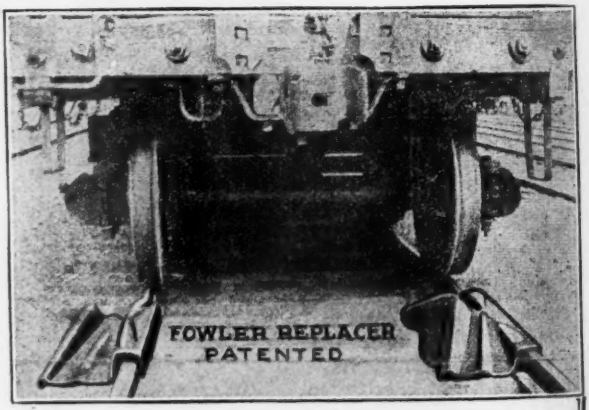
INSLEY MANUFACTURING CO.

Engineers INDIANAPOLIS, INDIANA. Manufacturers

142

They're Pretty Nearly Worth Their Weight in Gold—

when a derailment occurs and things are tied up.



FOWLER CAR REPLACERS

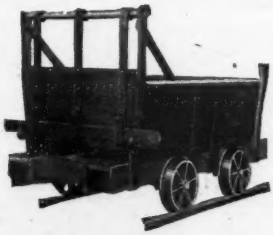
Fabricated of flange pressed steel, reinforced

Have tremendous sustaining power, yet are reasonably light in weight. Enable the replacing of a heavily loaded car or engine in a few minutes. Can be handled by one man. Their cost is trifling compared to their usefulness, even as insurance if nothing else. Built in two sizes.

Write for detailed description and prices

Track Equipment Co., Huntington, W. Va.

KOPPEL



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Always dependable—an ever serviceable car
that gives maximum service and long life.

Complete catalogue on request

KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.
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NEW YORK, 30 Church St., Room 512
SAN FRANCISCO, Koppel Sales Co., Rialto Bldg.
PHILADELPHIA, 1420 Chestnut St.

Look at It!

Strong, closely woven cotton duck, especially folded and welded together by close lock-stitching and seasoned in oils by a secret process—

That's why Gandy, the original stitched duck belting is able to drag out every ounce of power, and withstand the rigors of heat, cold, steam, acid and grit.

Call on us for facts and figures on Gandy Belting. We'll send them promptly with sample.

To be sure of the genuine Gandy Belt look for the painted green edge and Gandy trademark.

The Gandy Belting Company

Main Office and Factory:
750 West Pratt St., Baltimore, Md.

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A VALUABLE FEATURE of the BYERS AUTO CRANE is its CATERPILLAR TRACTION

which enables its use "most anywhere" practical. This machine is equipped, as desired, with either road wheels or rail truck mounting.

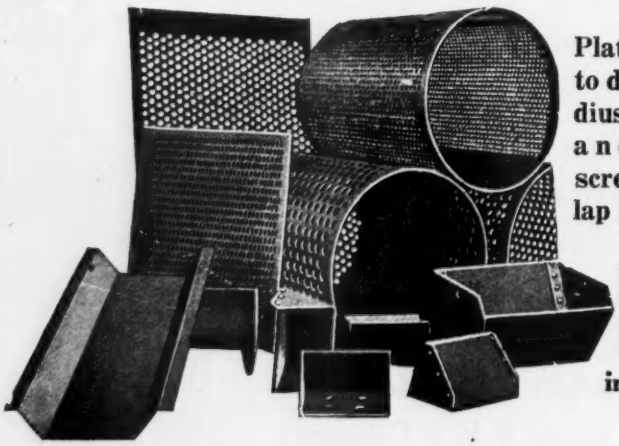
The "BYERS" is rendering satisfactory service in material handling, stripping, car unloading, excavating, derrick-work, etc.

We shall be pleased to send you a descriptive booklet on request.

THE JOHN F. BYERS MACHINE CO.

430 SYCAMORE STREET RAVENNA, OHIO

Perforated Metal Screens FOR STONE, SAND, GRAVEL, ETC.



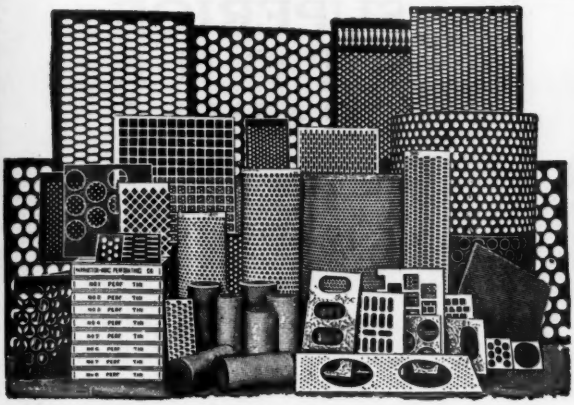
Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints.

Elevator Buckets in all styles and sizes

HENDRICK MFG. CO., 39 Dundaff Street CARBONDALE, PA.

Perforated Steel Screens

of Every Description



For STONE, GRAVEL, SAND, CEMENT And All MINERALS

The Harrington & King Perforating Co.

638 N. Union Avenue
CHICAGO

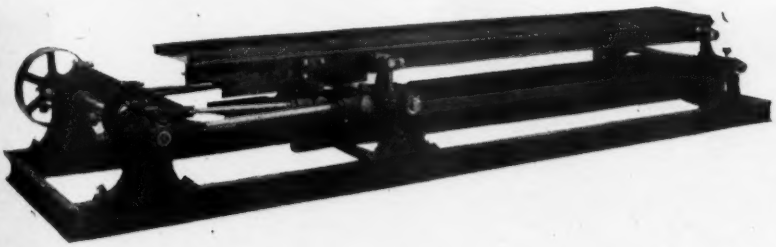
114 Liberty Street
NEW YORK

THE BALANCED ACTION SHAKER SCREEN

THAT SHAKES

WITHOUT VIBRATION

Works as quietly and as smoothly as a steam engine. No bumps, no jars, no grinding annoyance. Just a steady all-day, all-service machine built for one purpose—to separate mineral aggregates cheaply, thoroughly, with little power and less upkeep. Note that patented Rocker Arm? See how it makes the backward travel of one frame assist the forward travel of the other? It "cushions" the sudden stopping of one frame by the starting action of the other. Simple? Yes, and it does the work—quietly, quickly and efficiently. And it stands up under conditions that have scrapped many other types. A right design combined with proper construction securing the durability of structural steel, grey iron, bronze and babbitt. Write for catalog.



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MINNEAPOLIS
MINNESOTA

Built Especially for Stone Quarries

Spread 6'6"
Height 8'
Weight
3800 lbs.

No. S. Y. 12

SUPERIOR STONE GRAPPLE

Has a grip that a seven-ton stone cannot loosen. Yet its powerful manganese steel calked fingers quickly pick up or release rocks weighing from a few hundred to fifteen thousand pounds, at the will of the operator.

Simple in design and has few parts, so that finger tips, joint pins and bushings can be replaced at small expense when necessary.

Type S. X. 5, having five forged fingers with tool steel points, is designed for handling rocks of 15 tons and upward, used in building breakwaters and similar work.

Built by

Superior Iron Works Co.

Superior, Wis.

OSGOOD 18 ¾ yd. Traction Revolving Steam Shovel

is a splendid investment and one that has earned substantial profits for many companies operating Stone Quarries, Sand and Gravel Pits, etc. Its wide range of action and high dump make it especially popular.

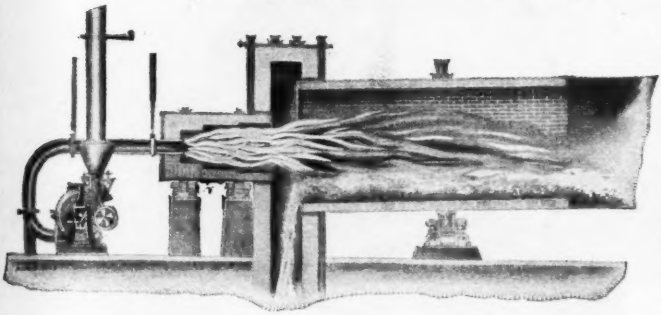
THE OSGOOD COMPANY

MARION, OHIO

Write today for copy of our new General Catalog D-2

PULVERIZED COAL

for Drying and Calcining



CEMENT
LIME
GYPSUM
MAGNESITE
DOLOMITE
BAUXITE
PHOSPHATE ROCK
ETC.

THE AERO PULVERIZER

Burns coal like a gas, producing at will a wide range of temperature, a flame, the physical and chemical character of which is regulable—one that may be elongated or shortened, made oxidizing, reducing or neutral as occasion may require.

Write for Literature

AERO PULVERIZER COMPANY

1441 Equitable Bldg., **NEW YORK, N. Y.**

Weight Life Efficiency

For 20 years the Kingsford Sand Pumps have been acknowledged the standard. Made in all sizes.

KINGSFORD FOUNDRY AND MACHINE WORKS

Oswego, N. Y.

ALL buckets come full—
ALL the time.

Loading by Hand Is Out-of-date!

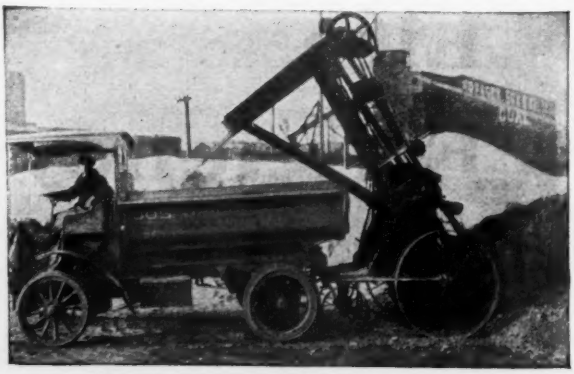
Even if you can get laborers, will they dig out and load 5 cu. yd. trucks in 5 minutes? Will they do that work for 5 cents? And will they continue at that speed as long as there are trucks to be loaded?

The famous Haiss "Path Digging," self-propelled wagon loader equipped with those ingenious Self-Feeding Propeller Blades will do this work without a hitch!

Write for the new booklet, No. 1119—Free.

THE GEO. HAISS MFG. CO., 142 St. and Rider Ave., New York City

Handling Crushed Stone, Gravel and Sand with G.-W. Loaders



THERE are a number of contributing reasons for the quick-loading ability of the G-W Wagon Loader.

FIRST—The frame is of light steel, though exceedingly strong and rigid, making it easy to move the machine about.

SECONDLY—The collapsible feature permits the machine to be lowered to clear obstructions such as are found in many yards. To raise or lower the machine, less than one minute is required.

THIRDLY—All mechanism is a model of simplicity, making for easy and rapid handling, and minimum upkeep.

By all means get our "Bulletin 40." It's full of data and pictures showing what G-W Wagon Loaders can do in the way of handling crushed rock, gravel, sand, etc.

Gifford-Wood Co.

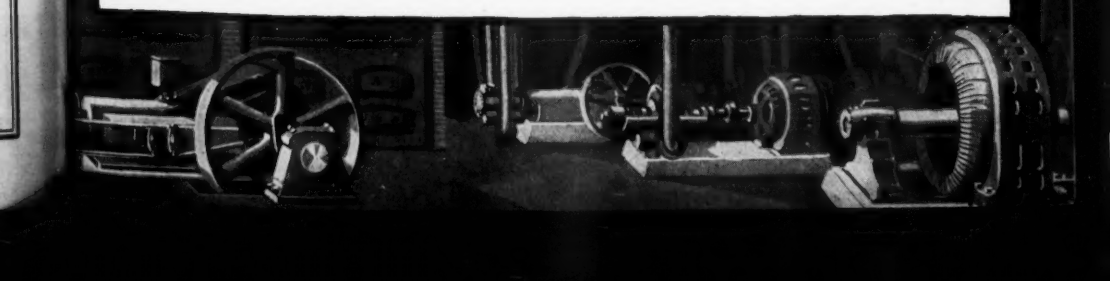
HUDSON, N. Y.

New York Boston Buffalo Chicago

TO MANUFACTURERS of POWER PLANT EQUIPMENT and SUPPLIES:

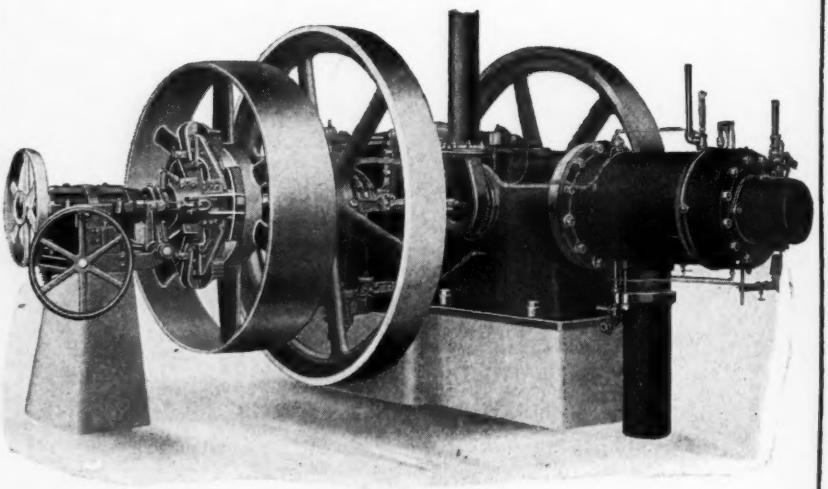
The sand and gravel, stone, cement, gypsum and lime industries, composing the field served by PIT and QUARRY, employ an aggregate of about two million horse power, and offer a large and ready market for all kinds of power and transmission machinery and supplies.

PIT and QUARRY, by its 100% complete circulation in this field, makes these industries entirely accessible to you at one expense. Advertising rates and A. B. C. circulation data upon request.



Your Plant Operated by a Muncie Oil Engine

Will pay greater dividends than any investment you could possibly make.



100 H. P. Special Heavy Duty Crude and Fuel Oil Engine

Operates successfully on cheapest grades of crude or fuel oils, as well as light distillates or kerosene, built in fiftten sizes, 10 to 125 H. P.

Write today for Catalogue No. 23.
Tell us your requirements and we will forward you interesting data on your particular plant.

Muncie Oil Engine Company

140 Pittsburgh Ave., Muncie, Indiana

Boiler and Furnace Testing

By RUFUS T. STROHM

A boiler test is necessary in order to determine how well the boiler is doing the work expected of it; that is to say, we must find out whether we are wasting coal in making steam and how much this waste may be. Such a test may be made to discover the efficiency of the boiler, or the quantity of water it is evaporating, or the cost of evaporating 1,000 pounds of water.

The United States Fuel Administration recommends that every boiler plant have some means of daily checking the efficiency of the boiler and furnace. The simplest and best way of finding out how efficiently the boiler is working is to make an evaporation test, as described in this bulletin. All the necessary records can be made automatically with suitable instruments, although in many small plants the coal must be weighed on ordinary scales. The efficiency of the furnace can be found by making analyses of the flue gases.

Too many engineers and firemen have the idea that they are not fitted to make boiler tests. This is altogether wrong. Any man who can weigh water and coal and read steam gages and thermometers is able to do the work required in making a boiler test for evaporation or efficiency. Such a test requires a knowledge of the following items:

1. The total weight of coal used.
2. The total weight of water fed to and evaporated by the boiler.
3. The average temperature of the feed water.
4. The average steam pressure in the boiler.

If these four items are known, a series of simple calculations will show how much water is being evaporated per pound of coal, and the efficiency of the boiler and furnace.

To make a test, the following apparatus and instruments are necessary.

1. Scales to weigh the coal.
2. Apparatus to weigh or measure the feed water.
3. Thermometers to take feed-water temperature.
4. Gages to indicate steam pressure.

A boiler test to be of value should extend over a period of at least eight hours. The longer the test the more accurate the results.

Weighing the Coal

The weight of coal used during a test may easily be found by using an ordinary wheelbarrow and a platform scales, arranged as in figure 1. At each side of the scales build an incline with its top level with the top of the platform, but take care not to have either one touch the platform. Set the empty wheelbarrow on the scales, run the movable weight or poise out until it exactly balances the weight of the barrow and lock it in position with the thumbscrew.

Next put weights on the scale pan *A* to correspond to a net weight of 250 or 300 pounds of coal. Fill the barrow with coal, run it on the scales, and add coal or take off coal until the scales balance. This is easily done by having a small pile of coal *B* beside the scales. If the weights on the scale pan represent say, 300 pounds, the net weight of coal in the barrow is exactly 300 pounds. This coal is wheeled in front of the boiler and dumped on the clean floor, and the barrow is returned for another load.

Each time the barrow of coal is weighed on the scales and taken to the boiler being tested, a tally mark should be made on a board nailed to the wall beside the scales. Each tally mark represents 300 pounds of coal, since the amount of coal in the barrow is adjusted at each weighing, so that the scales just balance. At the end of the test, therefore, the number of tally marks is multiplied by 300, and the product is the weight of coal used, provided it has all been fired; but if any coal remains in front of the boiler at the close of the test, it must be gathered up and weighed, and its weight must be subtracted from the total weight indicated by the tally marks to get the number of pounds of coal actually fired. The test, of course, should be started with no coal in front of the boiler.

Care must be taken not to forget to make a tally mark each time a barrow of coal is run off the scales. By setting the scales so as to show any net weight, such as 250 or 300 pounds,

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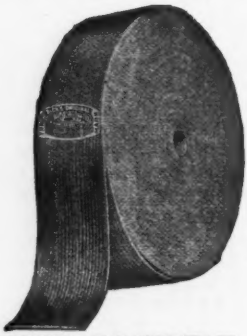

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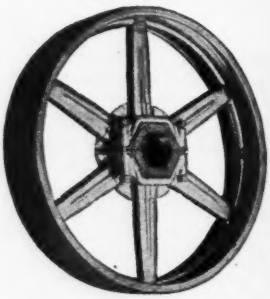

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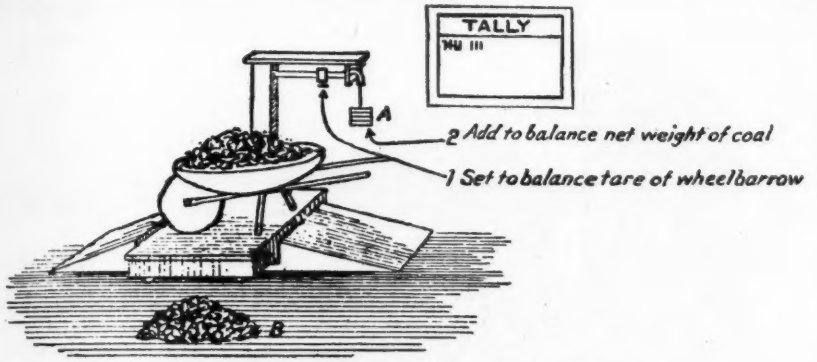


Figure 1. Apparatus for weighing coal for tests.

and making each barrow load exactly this weight, much time is saved, as it is unnecessary to change any of the weights or the position of the rider on the scale beam.

If the coal used in the test is to be analyzed, take a sample of from 4 to 6 pounds from each barrow and throw it into a box near the scales. Do this *before* the coal is weighed. These small amounts from the various barrow loads will then give a fair average sample of the coal used during the test.

The condition of the furnace should be the same at the end of the test period as at the start. Therefore, at the moment the test is begun, observe the thickness of the fuel bed and the condition of the fire. If the fire was cleaned, say, an hour before the test began, see that it is cleaned an hour before the time when the test is scheduled to end. If the coal was fired, say 8 minutes before the test started, the last coal used during the test should be fired eight minutes before the end of the test. The object of these precautions is to insure the same conditions at start and finish, as nearly as possible, otherwise, the coal weighed will not be the same as the coal consumed.

Measuring the Feed Water

The quantity of water fed to the boiler during the test may be found by metering or by weighing. A reliable water meter is recommended for this work. There are a number of good makes, of different types, such as:

1. Venturi meter.
2. Weir or V-notch meters.
3. Diaphragm meters.
4. Displacement meters.
5. Water weighers.

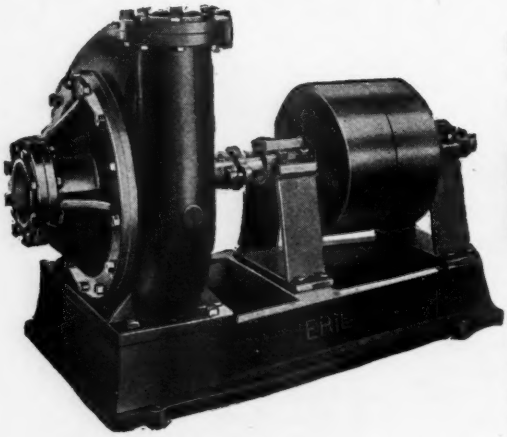
The best form of meter to use in any particular case depends on the local conditions in the plant; but *every plant should be provided with a permanently installed meter of some type.* The displacement form of meter should be used only with cold water, however.

If there is no meter or water weigher in the plant, the feed water used during the test can be measured by the three-barrel arrangement illustrated in figure 2.

Obtain three water-tight barrels, and set two of them close together on a platform directly over the third, leaving about 12 inches above barrel 3 in which to fit the valves *V* and the nipples in the bottoms of barrels 1 and 2. Near the top of each of the barrels 1 and 2 screw a 1-inch overflow pipe *O*.

Run a pipe *P* from the city main or other source of supply above barrels 1 and 2, and put a valve *A* on the pipe leading to each barrel. From barrel 3 run a suction pipe to the feed pump that is to pump water to the boiler to be tested. It is best to have a by-pass from the usual water supply direct to the feed pump, or to another pump connected to the boiler, so that in case of any trouble with the testing barrels, the regular operation of the boiler may be resumed without shutting down.

The next step is to fill barrels 1 and 2 with water until they overflow at *O*. This water should be of practically the same average temperature as that which is to be used during the



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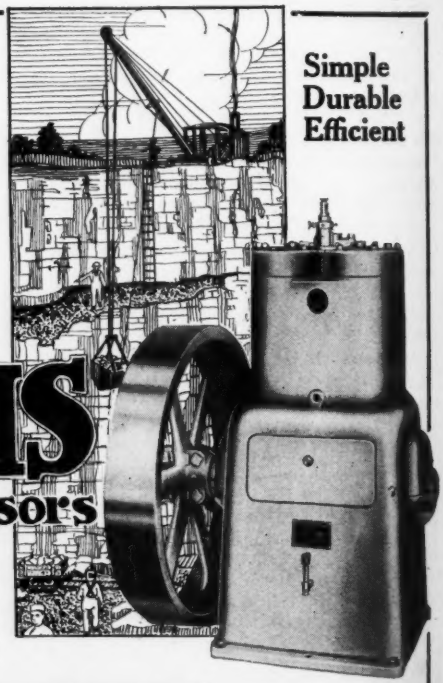

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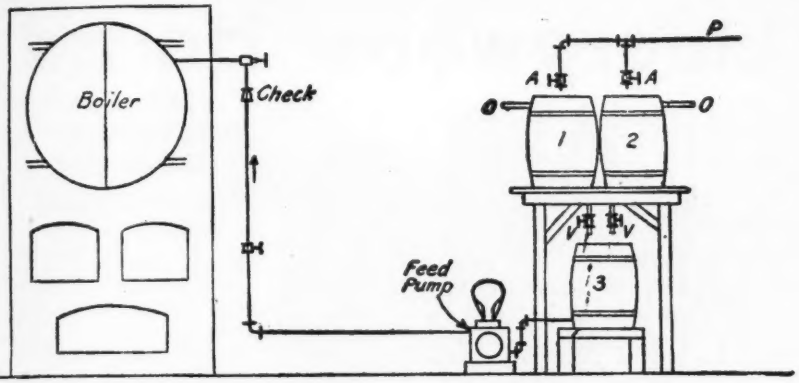

Figure 2. Device for measuring feed water.

test. Barrel 3 should be high enough above the feed pump so that the pump will handle hot water. Put barrel 3 on a scales, before connecting it to the feed pump, and weigh it. Then let the water from barrel 1 run into barrel 3, and weigh again. The second weight minus the first weight is the net weight of water contained in barrel 1 when filled to the overflow. The weight of water in barrel 2 when it is filled to the overflow can be found in like manner. Mark these weights down.

When the net weights are found and barrel 3 is removed from the scales and connected to the feed pump, the apparatus is ready to begin the test. Start with the level of the water about 1 foot below the top of barrel 3, and drive a nail into the barrel to mark this level. When the test is finished, the level should be brought to the same point, so that the water that has passed through barrels 1 and 2 will accurately represent the weight of water fed to the boiler during the test.

When the test is to begin, stop the feed pump and tie a string around the gage glass on the boiler to mark the height of the water level in the boiler. Then start the pump connected to barrel 3. Fill barrels 1 and 2 up to the overflow before the test is started. Then open the valve *V* on barrel 1 and let the water run into barrel 3 as fast as the feed pump draws water from barrel 3. When barrel 1 is emptied close its valve *V* and open its valve *A* so as to refill it.

While barrel 1 is filling empty barrel 2 into barrel 3 in the same way, and continue to fill and empty barrels 1 and 2 alternately. In this way barrel 3 will be kept supplied with water that has been measured in barrels 1 and 2, the net weights of which were found before the test began. Keep a separate tally of the number of times each of the barrels 1 and 2 is emptied into barrel 3. At the end of the test the number of tallies for each barrel multiplied by the weight of the water that barrel will hold will be the weight of water measured in that barrel. The sum of these weights for barrels 1 and 2 will be the weight of water used in the test.

With a three-barrel arrangement like this, water can be weighed rapidly enough to supply 300 boiler horsepower.

(To be continued)

The Gaston Granite & Quarries Co., Gastonia, N. C., has been organized with a capital of $250,000, to operate granite quarries in this section. The company is headed by J. Lanier Gray, Joseph H. Separk and E. C. Jennings.

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The Birmingham Slag Co., Jefferson County Bank Building, Birmingham, Ala., is planning for the establishment of a new slag crushing and screening plant at Alabama City.

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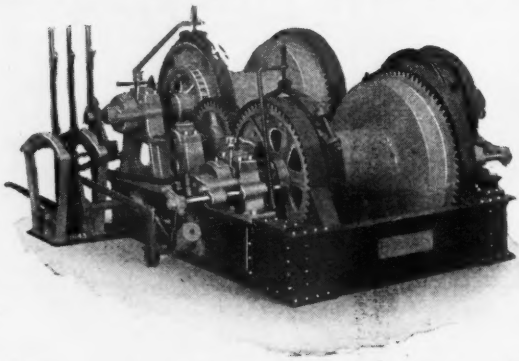

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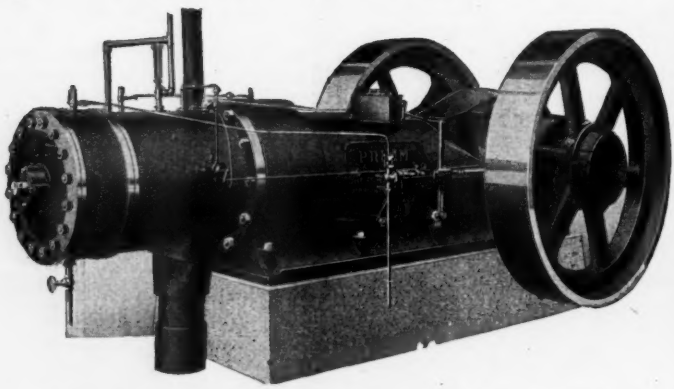

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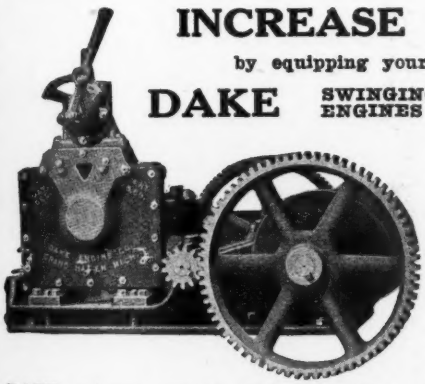

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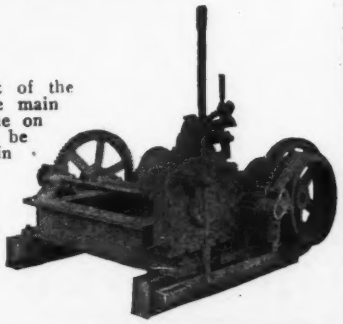

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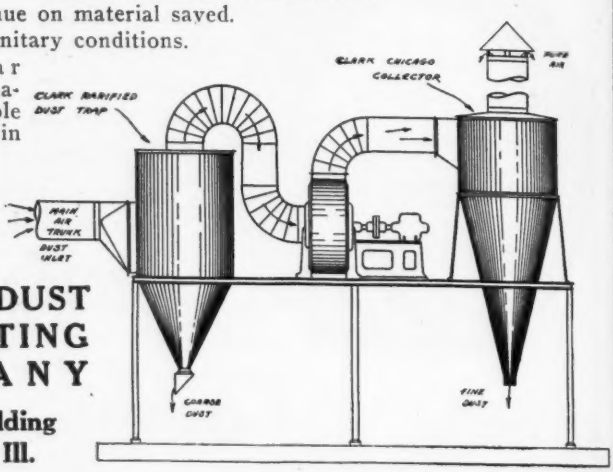

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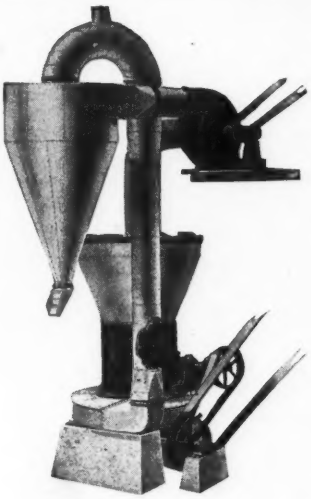

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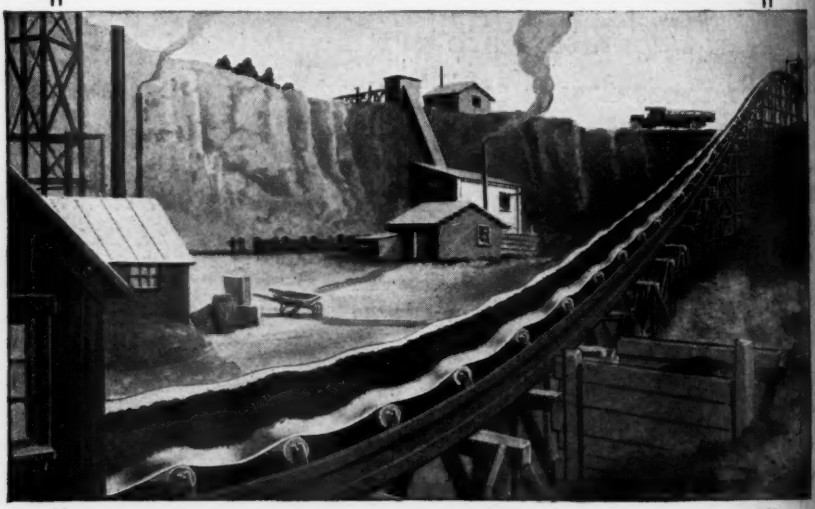

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